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MID-PACIFIC OCEANOGRAPHY
Part V, Transequatorial Waters, May-June 1952, August 1952

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Explanatory Note

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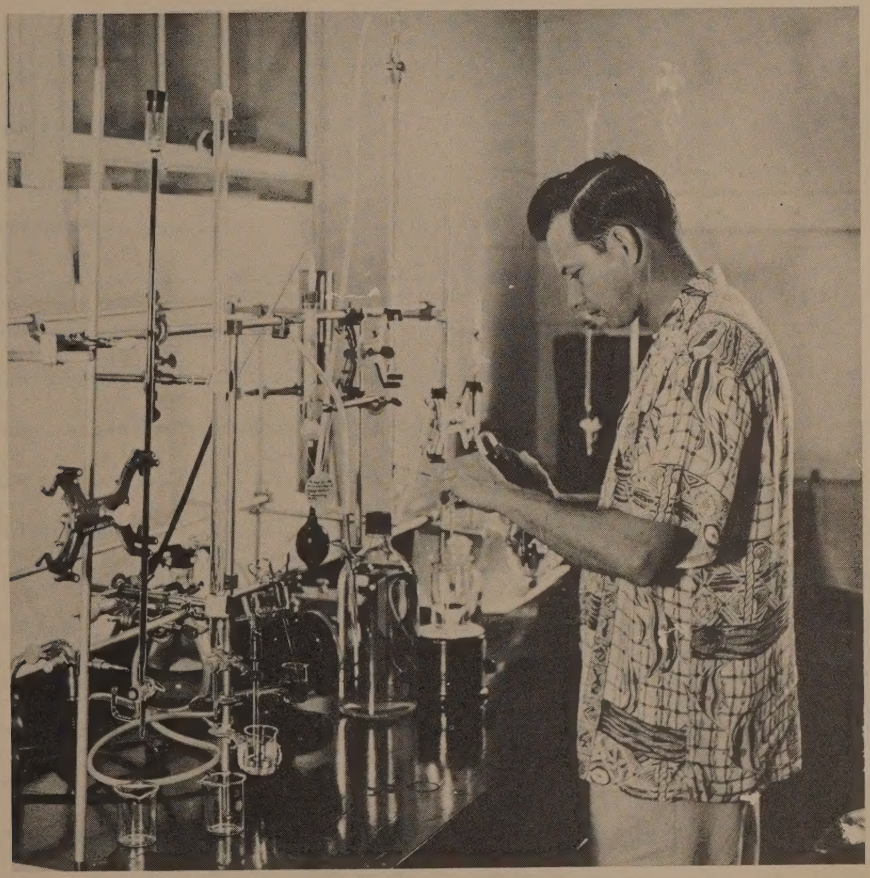

MID-PACIFIC OCEANOGRAPHY PART V

TRANSEQUATORIAL WATERS

MAY-JUNE 1952, AUGUST 1952

By

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Introduction

The first four reports in this series, Cromwell (1951 and 1954), Austin (1954) and Stroup (1954), discuss the results of cruises which were planned to provide data leading to a general understanding of the physical and chemical oceanographic features in the mid-equatorial Pacific (140°W. to 180th meridian). The present report is principally concerned with cruise 15 of the Hugh M. Smith, a cruise planned so as to provide data relating to the temporal changes along a meridional section across the equatorial circulation. Also included (Appendix I) are the conventional oceanographic data from cruise 16 of the Hugh M. Smith during which a study of the currents was made by means of shallow and deep drags. Preliminary results from this cruise have been reported by Cromwell, Montgomery, and Stroup (1954). A more detailed report is being prepared.

The present report is descriptive. Its primary purpose is to present the data in a form suitable for staff use and for use by other organizations studying the oceanography of the mid-Pacific region. The data are presented in tabular and graphical form, with but brief descriptions of the salient features. More complete analytical reports will follow as sufficient data from POFI oceanographic cruises in the equatorial region are accumulated.

The cruise plan for Hugh M. Smith cruise 15 called for a joint cruise with the Cavalieri, a vessel chartered by POFI to explore the feasibility of commercial longline fishing in the equatorial area. The Hugh M. Smith was to precede the Cavalieri along 140°W. longitude, determine the current boundaries and advise the Cavalieri where to start fishing. However, due to mechanical failure aboard the Cavalieri, she was forced to temporarily abandon the fishing and return to Honolulu for repairs. The Hugh M. Smith continued the program of oceanographic stations as scheduled.

The Smith departed Pearl Harbor, Territory of Hawaii, on May 21, 1952, and returned on July 1, 1952. The vessel completed a total of 60 oceanographic stations comprising four legs along 140°W. longitude between 9°N. and 7°S. latitudes. The station positions for cruise 15 are shown on figure 1. Table 1 summarizes the elapsed time for each of the four legs of the cruise.

Table 1

Station number	Position (140°W. long.)	Date	Elapsed time
1	08°59'N.	May 28	--
17	07°00'S.	June 3	6 days
31	08°00'N.	June 8	5 days
45	07°00'S.	June 14	6 days
60	09°00'N.	June 20	6 days

Each station consisted of a 13-bottle cast to 500 meters. Sea water samples for salinity and phosphate were taken at each depth sampled. Two 900-foot bathythermograph lowerings were made at each station with additional lowerings at 10-mile intervals between stations. Standard, 200-meter, oblique zooplankton hauls were made at each station using a 1-meter, 30xxx silk grit-gauze net. The samples collected by these tows have been processed and the resulting data will be discussed in a forthcoming report.

The vessel and procedures have been described in previous reports, particularly those by Cromwell (1951 and 1954). The method of plotting station data[1/] and construction of the vertical sections closely follows that of Montgomery (1954).

Some Results of Hugh M. Smith Cruise 15

Meteorological observations: Routine meteorological observations were recorded during the cruise. Entries were made at each of the 10-mile interval bathythermograph lowerings and at each of the oceanographic stations. The U.S.N. Hydrographic Office Oceanographic Log Sheet B (H.O. Pub. 606c) was used. These data are on file at Pacific Oceanic Fishery Investigations, the Scripps Institution of Oceanography, and at the U. S. Navy Hydrographic Office.

Because the zonal circulation and upwelling are primarily wind activated, the wind data from each leg of the cruise are given in figure 2. The data from which the arrows were drawn are listed in table 2. Unless there was a sudden change in speed or direction within increments of one degree of latitude, the speed and direction were averaged for each 60 miles. In figure 2, the direction, as given by the arrow, is to the nearest 10°; the length is proportional to the speed. The figure at the base of the arrow indicates the number of observations used in obtaining, independently, the average speed and direction.

Temperatures: Vertical temperature sections for the four station lines along 140°W. longitude are shown on figures 3 through 6. These cross sections were constructed from bathythermograph lowerings made at 10-mile intervals. The isotherms are at intervals of 2°F. The depth of penetration is indicated by the small horizontal dash. The surface temperatures, as measured in a sample drawn with a bucket, are shown in the top panel. Thermograph records, giving a continuous trace of the surface temperature for the cruise, are available in POFI files.

Referring further to figures 3 to 6, and reading from north to south (right to left), we see evidence of the Equatorial Countercurrent (downward slope of the isotherms from the northern limit of the section to approximately $4\text{-}1/2^{\circ}$N. latitude); the South Equatorial Current ($4\text{-}1/2^{\circ}$N. to southern limit of the section) and the equatorial divergence and upwelling (doming of the isotherms, centered at or near the Equator). The effect of this upwelling on the temperature of surface waters is evidenced in the surface-temperature curve in the upper panel. No well defined convergence, or front, as seen in some previous sections in this region (Cromwell 1953, 1954), was found.

One striking feature of the temperature sections in this area is the well defined thermocline in the region of the Countercurrent. The role which temperature plays with respect to density in this region is evident when these sections are compared with those for sigma-t, figures 8-11.

Attention is directed to the temperature inversions beneath the Equator on figures 3, 4, and 6. As the isotherms are at 2°F. intervals and the resulting isotherms are drawn for the even temperatures, this inversion is not shown in figure 5. Had the 69° isotherm been shown it would have been evident.

1/ The data for the Hugh M. Smith oceanographic cruises have been punched onto IBM cards; the calculations (sigma-t at interpolated depths and ΔD) performed on the Card Program Calculator and the observed, interpolated, and calculated data, as appropriate, tabulated directly onto the stencils. The procedures for the IBM calculations of these oceanographic data were formulated by the Division of Oceanography, U.S.N. Hydrographic Office, Washington 25, D. C. We wish to acknowledge with appreciation their assistance.

These temperature inversions are a characteristic feature of bathythermograms that we have taken at or very near the Equator. Six temperature-depth traces, taken during cruises along various longitudes and at various times, are shown on figure 7. Similar traces made 10 to 30 miles in a north-south direction from those depicted in figure 7 seldom show evidence of the inversion. During cruise 16 of the Hugh M. Smith, salinity samples were taken near the upper and lower depths of one of the inversions. The stable character of this feature, as evidenced from its relationship to the sigma-t surfaces, is shown on figure 7, lower panel.

Table 2.--Average wind direction and speed for observations recorded between latitudes listed in column 1

Position	$\bar{D}$	$\bar{F}$	No. obs.	Position	$\bar{D}$	$\bar{F}$	No. obs.
08°00'N.	047	16	6	06°45'N.	100	10	9
07°00'N.	050	18	9	06°00'N.	120	5	3
06°30'N.	040	15	7	05°00'N.	150	8	9
06°00'N.	080	13	6	04°00'N.	120	9	8
05°00'N.	077	15	6	03°00'N.	120	7	7
04°00'N.	180	8	7	02°00'N.	120	8	7
03°00'N.	180	8	7	01°00'N.	120	9	7
02°00'N.	100	5	5	00°00'	080	12	7
01°00'N.	136	4	7	01°00'S.	100	11	7
00°00'	107	8	7	02°00'S.	130	9	7
01°00'S.	089	9	7	03°00'S.	120	12	4
02°00'S.	114	15	7	04°00'S.	120	13	9
03°00'S.	105	12	7	05°00'S.	110	15	6
04°00'S.	094	14	7	06°00'S.	130	15	7
05°00'S.	098	13	7	07°00'S.	120	15	7
06°00'S.	084	9	7				
07°00'S.	099	4	6	06°00'S.	090	18	5
				05°00'S.	070	15	7
06°30'S.	126	14	3	04°00'S.	080	12	5
06°00'S.	131	6	2	03°30'S.	070	12	5
05°30'S.	128	6	4	03°00'S.	120	12	5
05°00'S.	065	4	2	02°00'S.	110	12	7
04°00'S.	125	6	6	01°00'S.	080	9	5
03°00'S.	045	6	5	00°00'	080	9	9
02°00'S.	051	9	6	01°00'N.	070	11	7
01°00'S.	051	11	7	02°00'N.	100	11	7
00°00'	081	12	8	03°00'N.	120	10	5
01°00'N.	083	12	5	04°00'N.	120	11	9
02°00'N.	112	12	7	05°00'N.	120	10	7
03°00'N.	131	13	7	05°30'N.	120	9	4
04°00'N.	121	12	6	06°00'N.	030	4	4
05°00'N.	130	12	7	06°30'N.	070	6	4
05°10'N.	113	15	3	07°00'N.	040	15	3
06°00'N.	129	6	5	08°00'N.	050	15	6
07°04'N.	073	8	9	09°00'N.	020	11	7
08°00'N.	104	10	7				

Sigma-t: The four sections for sigma-t are shown in figures 8 through 11. These sections, as is the case with the subsequent sections for salinity and phosphate, are arranged in the following order: southbound, stations 1 through 17; northbound, stations 17 through 31; southbound, stations 31 through 45; and northbound, stations 45 through 60. The sigma-t surfaces are drawn at 0.2 gm/l intervals.

In general, the picture may be considered characteristic for the central Pacific equatorial region. Reading from north to south (right to left on each of the four sections), we see the pronounced, relatively shallow density gradient associated with the northern edge of the Countercurrent; the inclined surfaces in the Countercurrent and domed configuration associated with the divergence in the South Equatorial Current at or near the Equator.

The trough at the Equator, first evident in the sigma-t surfaces at 75 to 100 meters below the surface, is similar to that pointed out by Cromwell (1954) as characteristic of this region.

Salinity: The salinity sections for the four legs of the cruise are shown on figures 12 to 15. In their general features, these sections are very similar to those described in previous reports of this series (Cromwell 1951, 1954; Austin 1954) and in the report by Montgomery (1954). The tongue of high salinity water (at 100-150 meters, southern half of sections) and the low salinity surface waters of the Countercurrent are pronounced features and will be subsequently discussed in the section on the temperature-salinity relationships (T-S curves).

Inorganic phosphate: The inorganic phosphate sections for each of the four legs are shown in figures 16 to 19. The values for each observation were obtained by means of the molybdenum method, using the Automatic Servo Operated Photometer (Snodgrass et al. 1953).

We can see that in the first two sections the 0.8 μg at/l isopleth reaches the surface in the region of the equatorial divergence, but is to be found beneath the surface waters in the last two sections. In the region of the northern edge of the Countercurrent there is a well developed "phosphocline" with the values increasing from 0.8 to 2.4 μg at/l in a depth range of 10 to 20 meters.

Attention is called to the trough in the phosphate isopleths at about 100 meters below the surface between 2°N. to 2°S. latitudes. Comparing the first section, figure 16, with the last, figure 19, we see the trough as broadened latitudinally, both to the north and south of the Equator, and the lower limit (2.2 μg at/l) decreased in depth from about 425 meters to 350 meters.

Temperature-salinity relationships (T-S curves): A temperature-salinity curve for each station of cruise 15 is plotted in figure 20. The curves have been grouped according to the latitude of the individual stations, 9°N. to 7°S. Interpolated values were used.

In discussing the T-S curve, Sverdrup, et al. (1942) point out that "By means of this diagram, characteristic features of the temperature-salinity distribution are conveniently represented and anomalies in the distribution are easily recognized." In the case of the cruise under discussion, these curves may serve a twofold purpose; they help to classify the zonal currents crossed on the section along 140°W. longitude, and they suggest the variations with time among the four stations at each latitude. Normally, data for the surface layer (less than 200 meters) are omitted, primarily because of seasonal variations and local modifications. In our case, however, these surface layer data, as well as the data from greater depths, have been included in order to show the variations with both time and latitude.

Figure 21 is a "fan" of T-S curves for the first leg of cruise 15. Selected station curves, have been plotted for latitudes between 9°N. to 7°S. (left to right in the figure).

Reading from north to south, we see that the first three curves may, when compared with those from several other cruises in figure 22, be considered as characteristic for the Equatorial Countercurrent. The surface salinity is relatively low and, with increasing depth down to a level of 50 to 100 meters, the temperature changes very markedly while there is relatively little change in salinity. The effect of this large temperature change on the vertical distribution of density is well demonstrated in figures 8 to 11, where the values for sigma-t increase from about 22.5 g/l to 25.5 g/l within a depth range of 10 to 25 meters. Below 300 meters, the T-S relationship is characteristic of the Equatorial Pacific water (Sverdrup, et al. 1942, p. 707). Although cruise 15 did not include stations in the North Equatorial Current, figure 23, giving the T-S relationship for various longitudes at 19°N., illustrates the markedly different characteristics of the adjacent waters to the north of the Countercurrent.

The relatively low surface salinities in the more northerly station of cruise 15 (5°N. to 9°N.) reflect the high annual total precipitation in this region. Jacobs (1951, figure 41, p. 82) shows that the annual total precipitation over the Pacific Ocean, 55°N. to 55°S., averaged for each 10° of latitude, reaches a maximum between the Equator and 10°N.

For comparative purposes, a summary of the rainfall in the Line Islands, somewhat to the west of the 140th meridian, is given in figure 24. The monthly mean rainfall is given for four of the northern Line Islands (Palmyra, Washington, Fanning, and Christmas), for Malden Island in the southern Line Islands, and for Canton Island in the Phoenix group. The position of each of these islands and the number of years of observations used for determining the means are given in table 3 below.

Table 3

Island[1/]	Latitude	Longitude	Years
Palmyra[1/]	5°38'N.	162°05'W.	2
Washington[2/]	4°50'N.	160°30'W.	3-5
Fanning	3°52'N.	159°23'W.	33-37
Christmas	2°00'N.	157°15'W.	4-7
Malden	4°01'S.	155°01'W.	36
Canton[3/]	2°46'S.	171°43'W.	7

1/ The data for Palmyra Island were from unpublished records provided by the U. S. Weather Bureau.

2/ The data for Washington, Fanning, Christmas, and Malden Islands were taken from an unpublished report prepared by C. E. Palmer (1953).

3/ The data for Canton Island were from published records of the U. S. Weather Bureau (1954).

Returning to Jacob's paper, his figures 43 and 44, page 85, show that on 140°W., between the Equator and 10°N., precipitation exceeds evaporation during the spring (March-May) and the summer (June-August). Hugh M. Smith cruise 15, May 28 to June 20, 1952, bridges his classification for the two seasons. Our data for the years 1950-1953, and between 140°W. and 180th meridian, indicate that the latitudinal position for salinity minimum and the maximum excess of precipitation over evaporation lies between 5° and 10°N. latitudes, rather than centered on 5°N. latitude (see Jacob's figure 51 D, p. 95). However, the effect of the horizontal flow (Equatorial Countercurrent and South Equatorial Current) on the surface salinity is yet to be studied. These zonal currents may, and undoubtedly do, displace the areas of maximum (or minimum) salinity in the direction of the surface flow and away from areas of maximum or minimum precipitation.

Proceeding to the two southernmost stations ($5^{\circ}30'$S. and 7°S.) in figure 21, the T-S curves are characterized by the salinity maximum above 200 meters. This maximum is present at these latitudes on all longitudes we have sampled, i.e., 140°W. to the 180th meridian (figure 25). That this high salinity with its origin from the subtropical convergence is continuous to the west of the 180th meridian can be seen from figure 30(b) of Mao and Yoshida (1953).

One particularly outstanding feature of figures 20 and 21, is the rather sudden transition in the T-S relationship between 1°N. latitude and the Equator. This suggests that the layer of salinity maximum is eradicated very near the Equator by processes associated with the equatorial divergence and upwelling.

Several similar stations within 1° north or south of the Equator and at various longitudes are shown in figure 26. The method of selecting the stations included in this figure was to choose the station, along the particular meridian, with the lowest surface temperature. Thus, their positions were near the center of the equatorial divergence. It is interesting to note that two of the stations thus selected (Hugh M. Smith cruise 15, station 11 and Hugh M. Smith cruise 16, station 18) show evidence of extension of the tongue of high salinity from the south; two are intermediate (Hugh M. Smith cruise 5, station 22 and Hugh M. Smith cruise 14, station 24) and the fifth station, number 34 for Hugh M. Smith cruise 5, suggests that processes associated with the divergence have limited the northward extent of the high salinity tongue.

Figure 27 serves as a summary of the T-S relationships discussed above. An average curve for the stations at 19°N., 7°N., the Equator, and 7°S. are shown. The T-S curves for the Equatorial Pacific and the Western North Pacific Central waters, as taken from figure 209 B, page 741 of The Oceans (Sverdrup, et al. 1942) have been included as broken lines.

Discussion

Thus far, this report has been concerned primarily with presenting the data from each of the legs of cruise 15 of the Hugh M. Smith and describing some of the more prominent features revealed by these data. Figures 28 to 31 were prepared to describe some of the temporal changes. For each field, temperature (figure 28), salinity (figure 29), sigma-t (figure 30) and phosphate-phosphorus (figure 31), selected isopleths have been plotted for the first and fourth legs of the cruise (stations 1-17 and 45-60).

In the upper panel of figure 28, we have plotted the surface temperatures as read from the bucket thermometer at each bathythermograph lowering (solid line, stations 1-17; broken line, stations 45-60). In the lower panel, the 60°, 70°, and 80° F. isotherms, for the two sections, are plotted against depth as smoothed curves. These isotherms were originally plotted in figures 3 and 6. At least four features are of interest:

1. The slope of the isotherms associated with the Countercurrent is greater in the fourth than in the first leg, suggesting an increased easterly flow of the Countercurrent.

2. The 80° isotherm - surface intercepts for the fourth section have moved to the north and south of those for the first section. This change is reflected in the surface temperatures (upper panel).

3. The 70° isotherm, lying below the surface at the Equator, shows considerably more "doming" in the fourth section.

4. The trough in the 60° and 70° isotherms, centered under the Equator in the first section, has shifted to the south in the fourth.

The salinity section, figure 29, shows considerable variation. There is a generally southerly shift in the selected isohalines when the two sections are compared. Also, the 34.8 °/oo isohaline was extended to the north through the region of the Countercurrent; the northerly tongue of 35.0 °/oo water, 3°N., between 50 and 100 feet, has essentially disappeared and the tongue of high salinity water from the south (35.6 °/oo, 7°N. to 1°S.) has broken into two segments.

A comparable figure for sigma-t, figure 30, shows a similar change in the slope of the isopleths in the region of the Countercurrent. In addition, the relative geographical positions for the selected sigma-t surfaces show a general displacement to the south when comparing the first and fourth sections.

The most apparent changes in the phosphate sections (fig. 31) are the deepening of the 0.8 and 2.0 μg at/l isopleths in the region of the Countercurrent (associated with the suggested change in flow mentioned in discussion of the temperature sections) and the change in configuration of the 0.8 μg at/l isopleth near to and south of the Equator.

Acknowledgement

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Special thanks are due to the members of the field party who were responsible for the program carried out aboard the Hugh M. Smith during cruise 15. The party included: Joseph E. King (field party chief), T. Roseberry, E. Niska, D. Ching, and D. Yamashita.

The successful completion of the sea-going oceanographic research program was dependent, in part, on the cooperation and efforts of the Captain and crew of the vessel.

I wish also to express my thanks to Mrs. Mary Lynne Godfrey for her efforts in assuring that the data were accurately processed and to Tamotsu Nakata for the preparation of the illustrations.

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Figures

Frontispiece: Titrating salinity samples in POFI laboratory, Honolulu, Territory of Hawaii. Photo by E. D. Stroup.

1. Station positions.
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5. Temperature section, stations 31-45.
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7. BT traces showing temperature inversions.
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9. Sigma-t section, stations 17-31.
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11. Sigma-t section, stations 45-60.
12. Salinity section, stations 1-17.
13. Salinity section, stations 17-31.
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No. 1, Appendix A. Station positions, Hugh M. Smith cruise 16, July 23 - August 29, 1952.

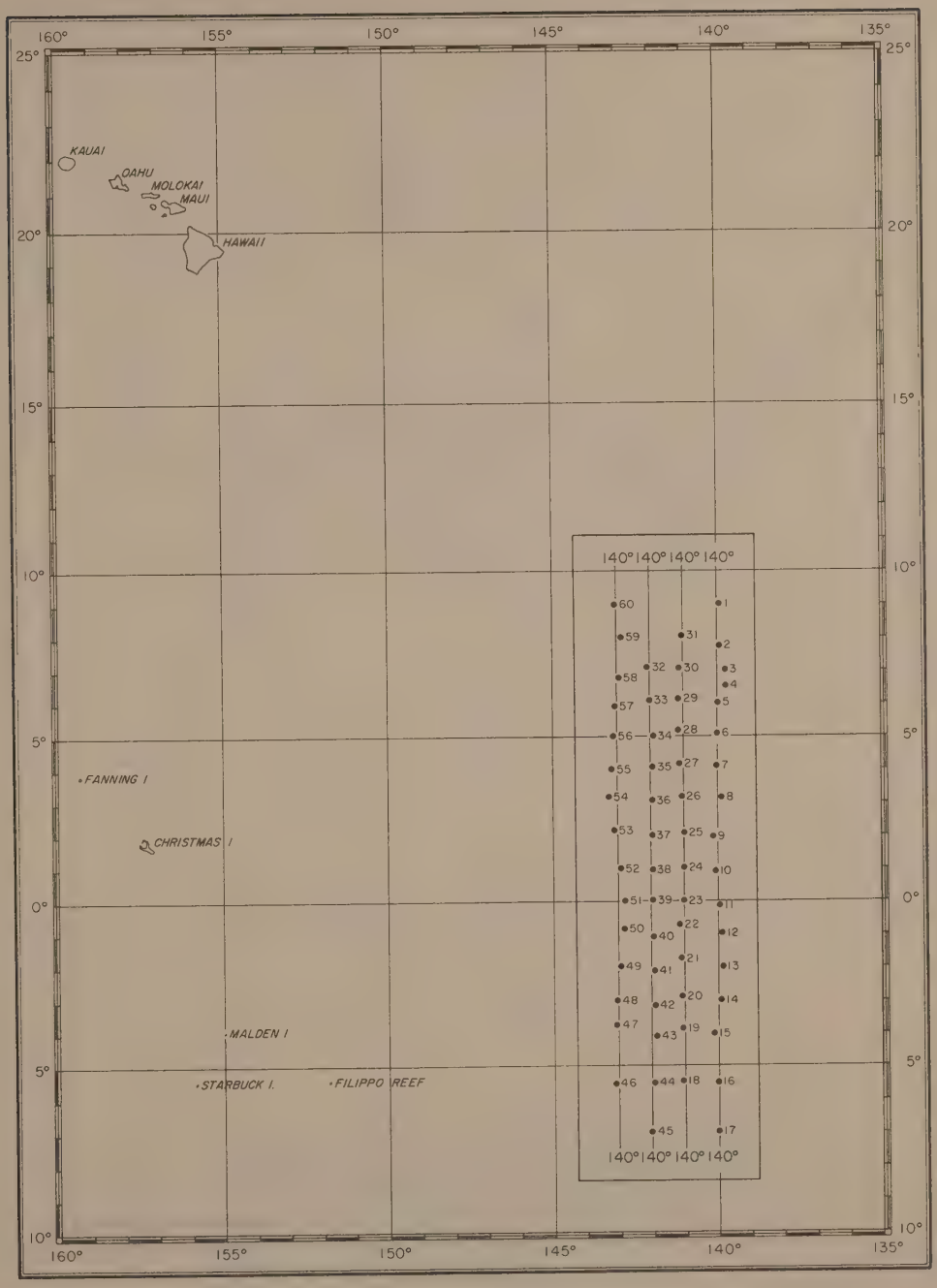


Fig. 1. -- Station positions for Hugh M. Smith cruise 15, stations 1-60, May 28 - June 20, 1952.

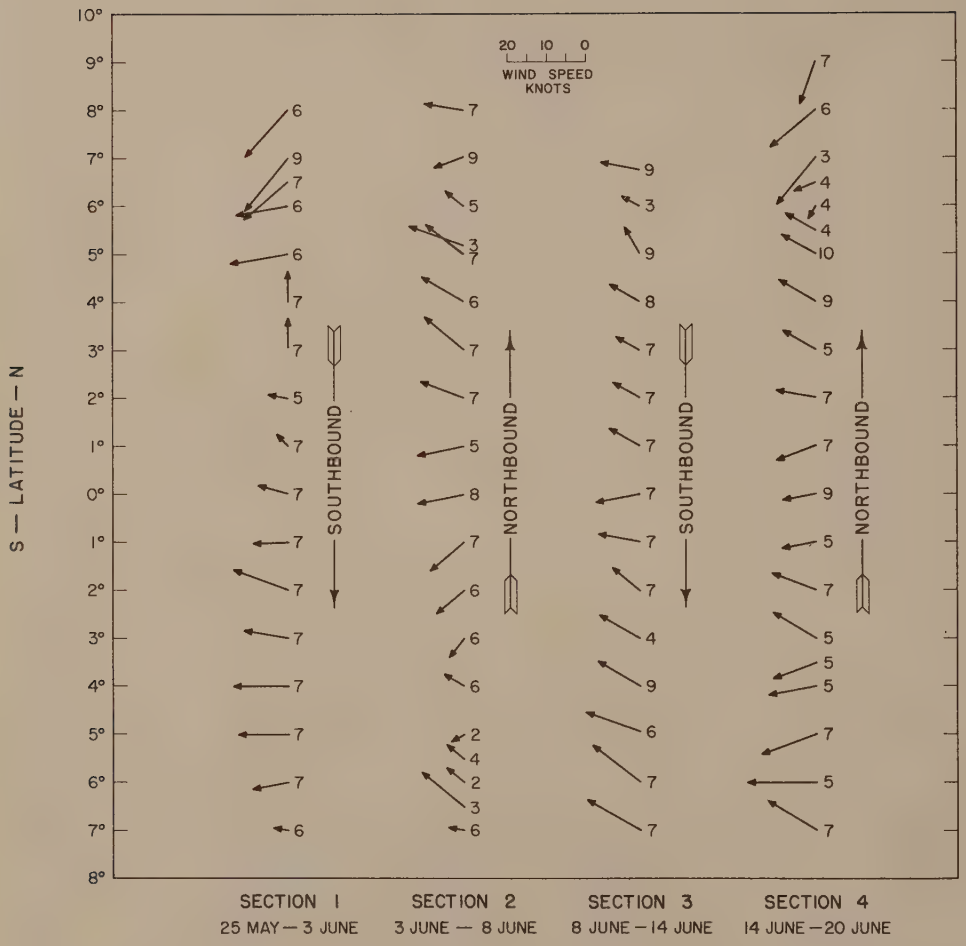


Fig. 2. -- Wind speed and direction. 140°W. longitude, May 28 - June 20, 1952. Each arrow denotes the average speed and the direction of the wind for all observations recorded in the interval of latitude from the position of the previous arrow. The figure at the base of the arrow is the number of observations included in each average.

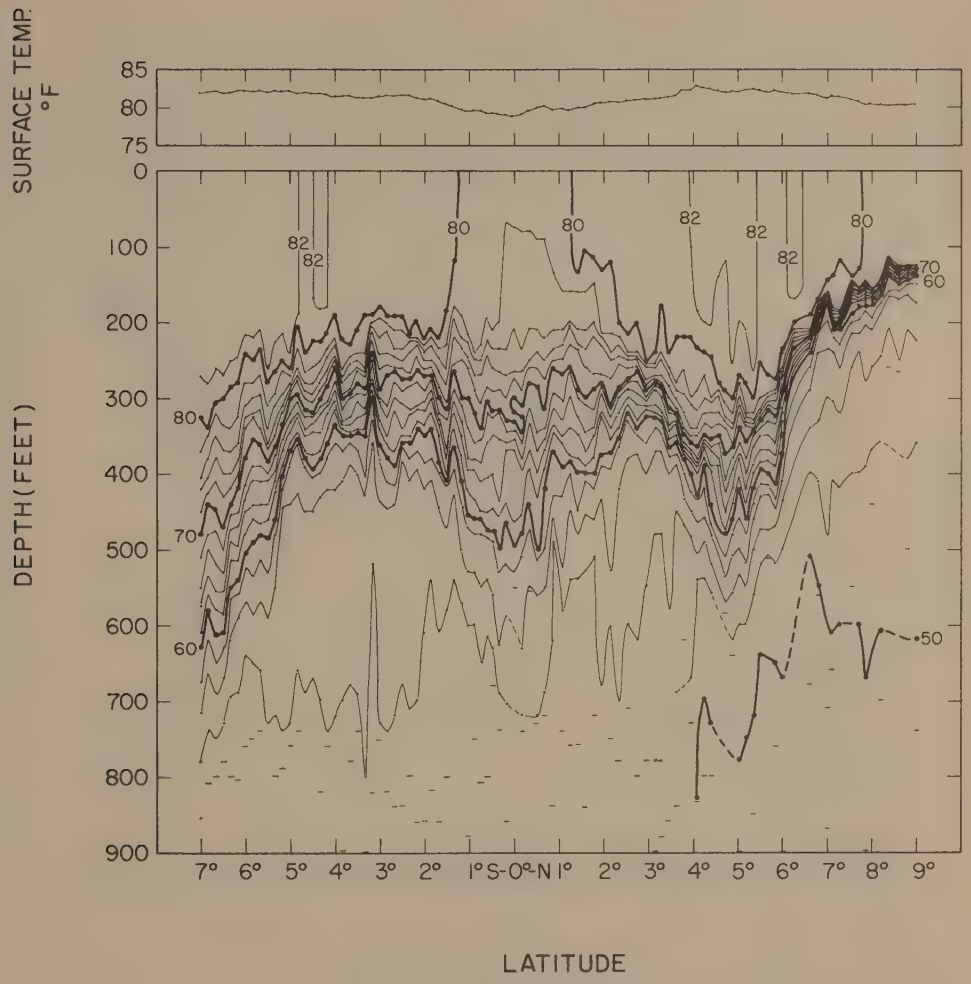


Fig. 3. -- Surface temperatures and vertical temperature section. Southbound, stations 1-17, May 28 - June 3, 1952. Upper panel. Surface temperatures as read at each bathythermograph lowering. Lower panel. Temperature section based on bathythermograph lowerings, isotherms at 2°F. interval, depth of lowering shown by small, horizontal dashed line.

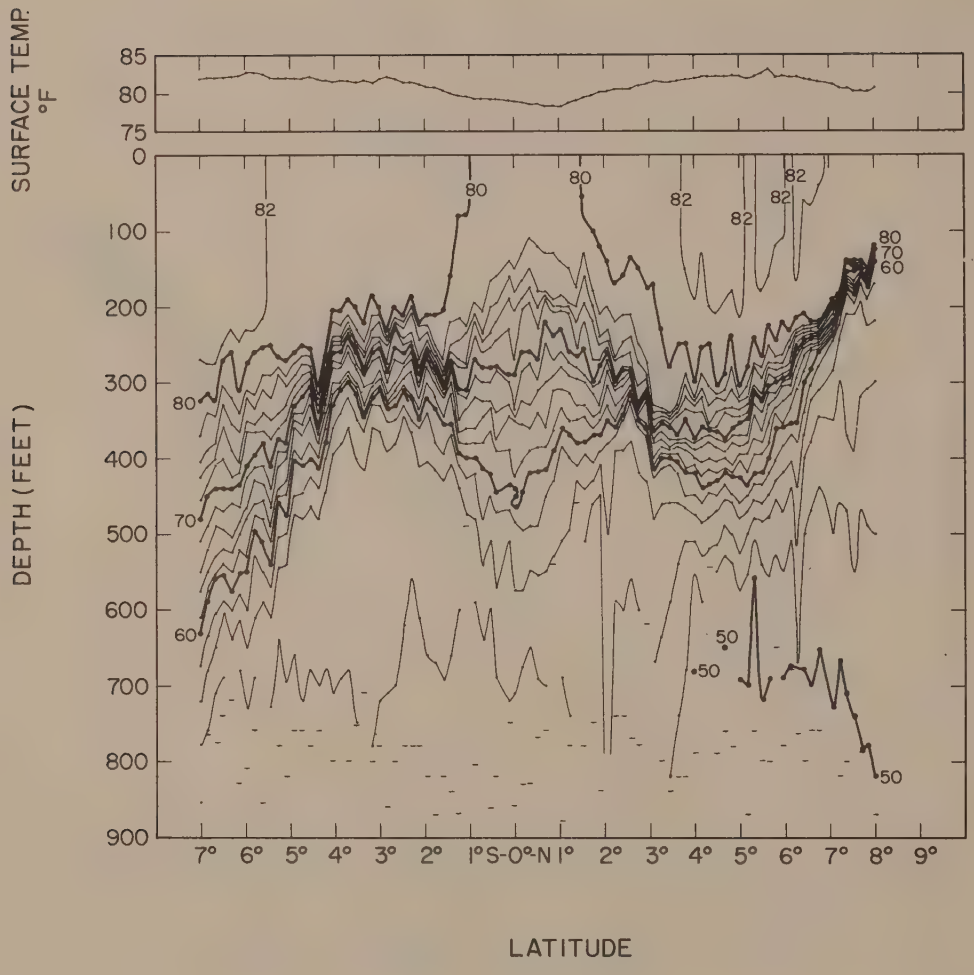


Fig. 4. -- Surface temperatures and vertical temperature section. Northbound, stations 17-31, June 3-8, 1952. Upper panel. Surface temperatures as read at each bathythermograph lowering. Lower panel. Temperature section based on bathythermograph lowerings, isotherms at 2°F. interval, depth of lowering shown by small, horizontal dashed line.

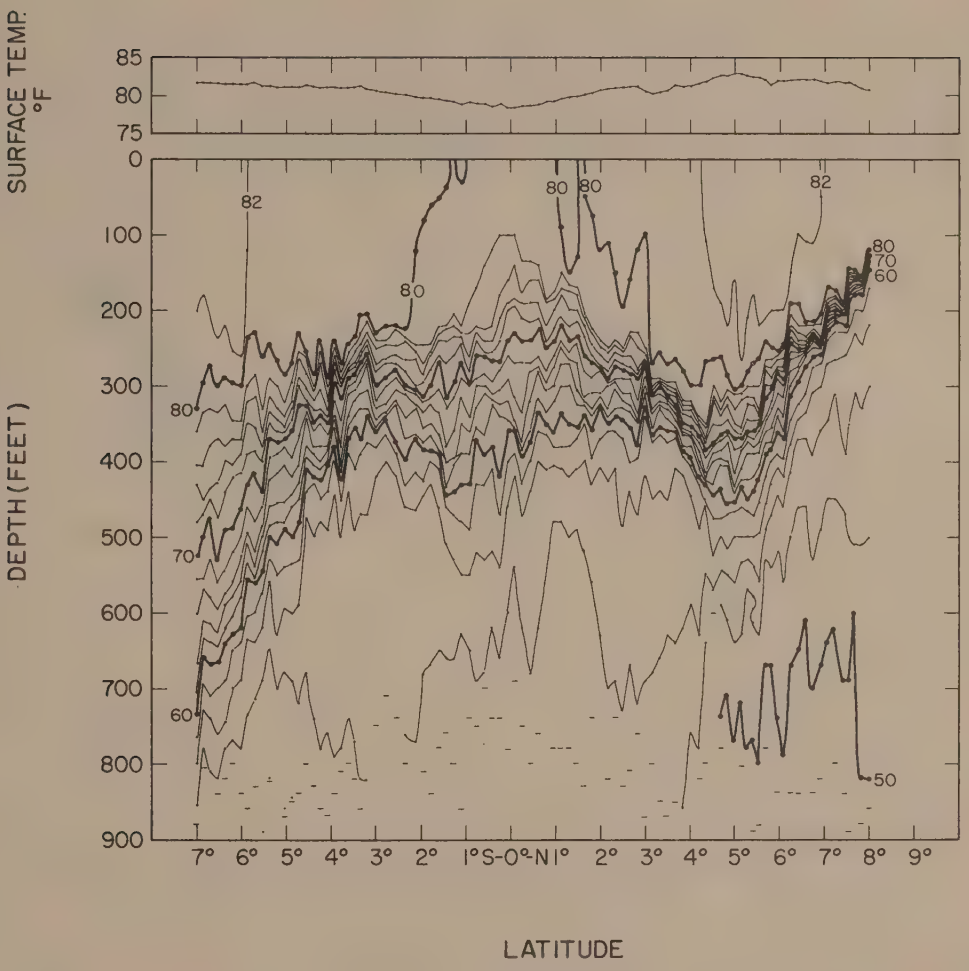


Fig. 5. -- Surface temperatures and vertical temperature section. Southbound, stations 31-45, June 8-14, 1952. Upper panel. Surface temperatures as read at each bathythermograph lowering. Lower panel. Temperature section based on bathythermograph lowerings, isotherms at 2°F. interval, depth of lowering shown by small, horizontal dashed line.

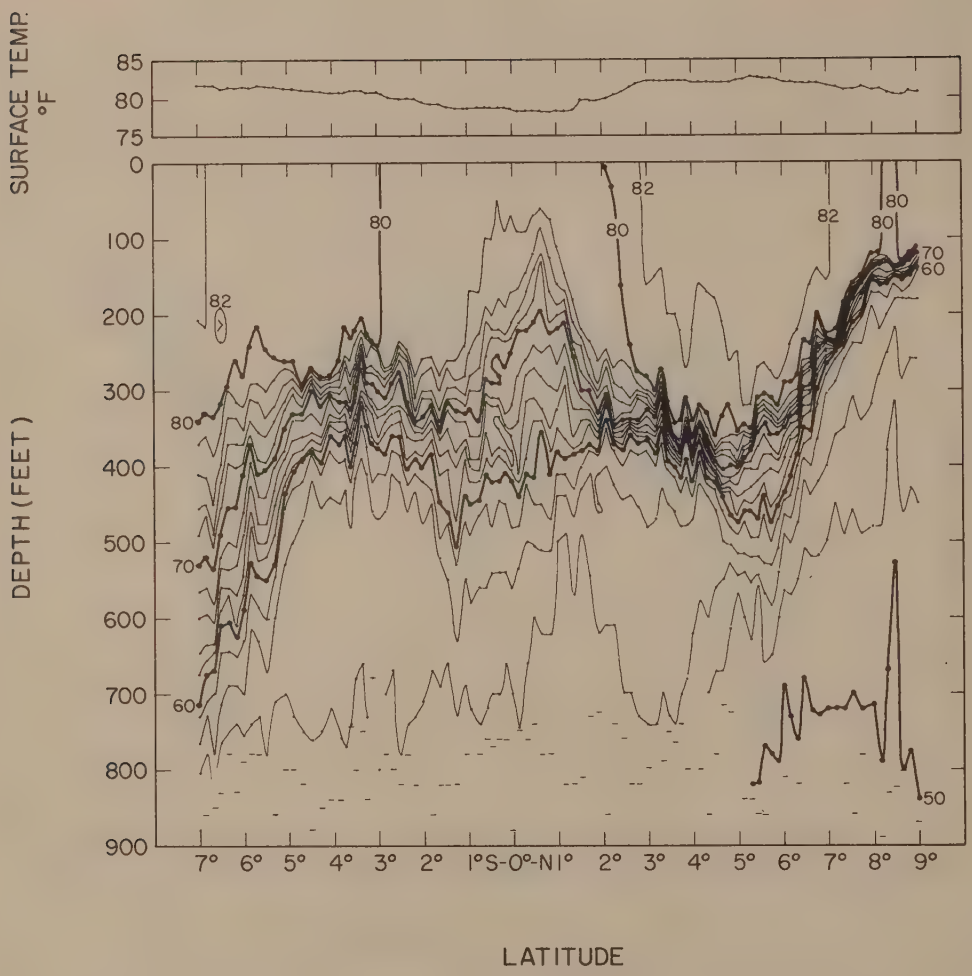


Fig. 6. -- Surface temperatures and vertical temperature section. Northbound, stations 45-60, June 14-20, 1952. Upper panel. Surface temperatures as read at each bathythermograph lowering. Lower panel. Temperature section based on bathythermograph lowerings, isotherms at 2°F. interval, depth of lowering shown by small, horizontal dashed line.

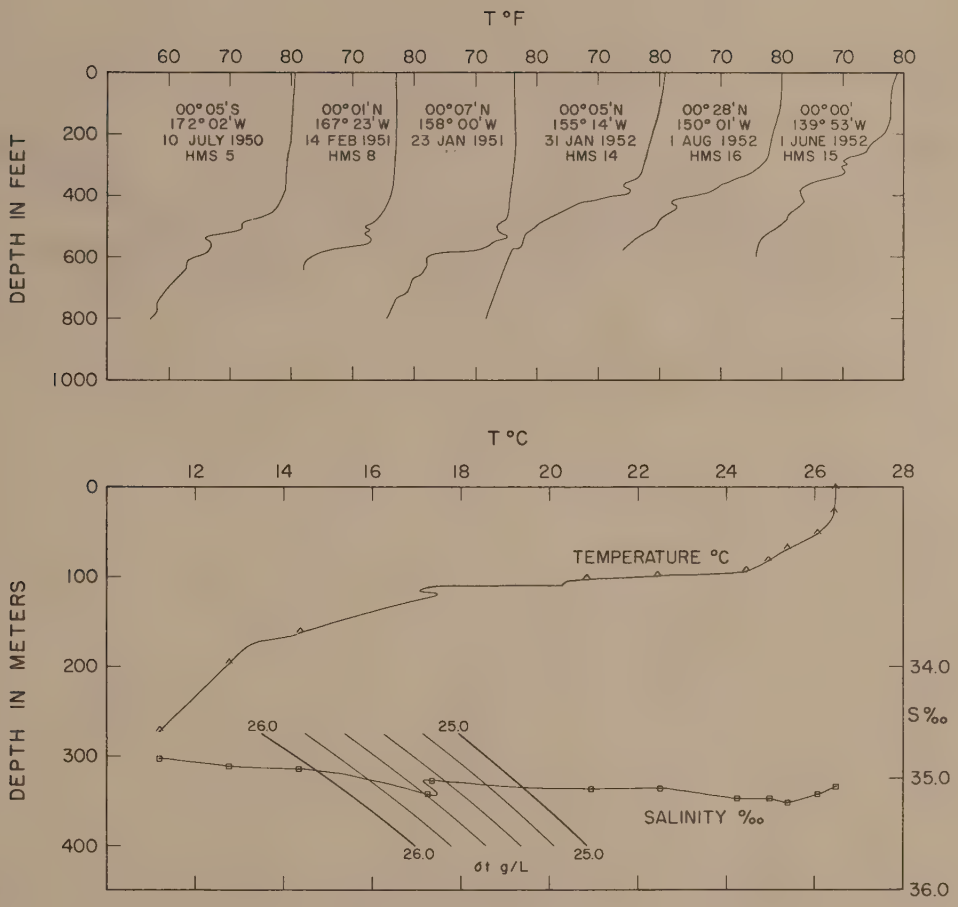


Fig. 7. -- Upper panel. Bathythermograph traces from five Hugh M. Smith cruises, various longitudes, showing temperature inversions at or near the Equator. Lower panel. Temperature-depth and salinity curves, Hugh M. Smith cruise 16, 0°28'N, 150°01'W., August 8, 1952.

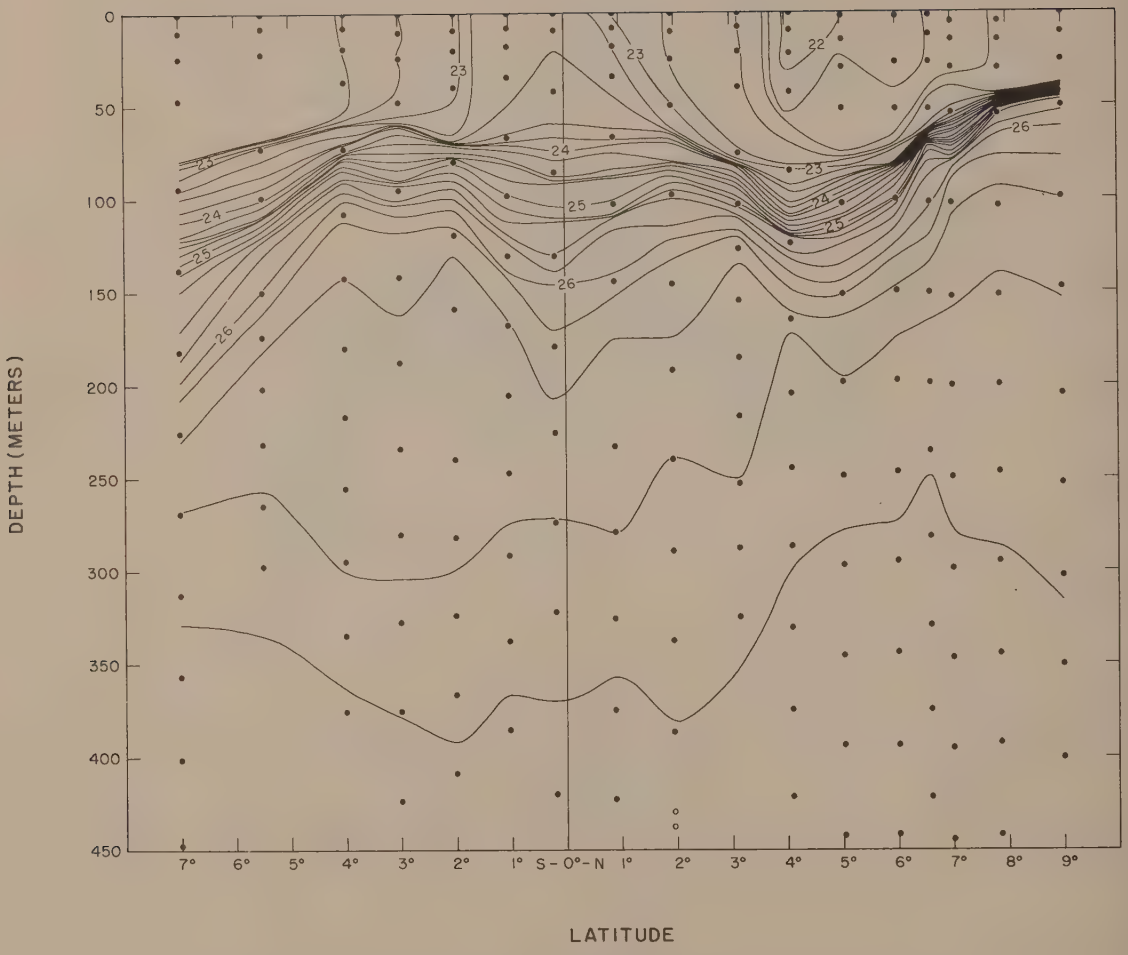


Fig. 8. -- Sigma-t. Southbound section along 140°W. longitude, 9°N. to 7°S., stations 1-17, May 28 - June 3, 1952. Sigma-t in grams per liter, isopleth interval 0.2 gm/l.

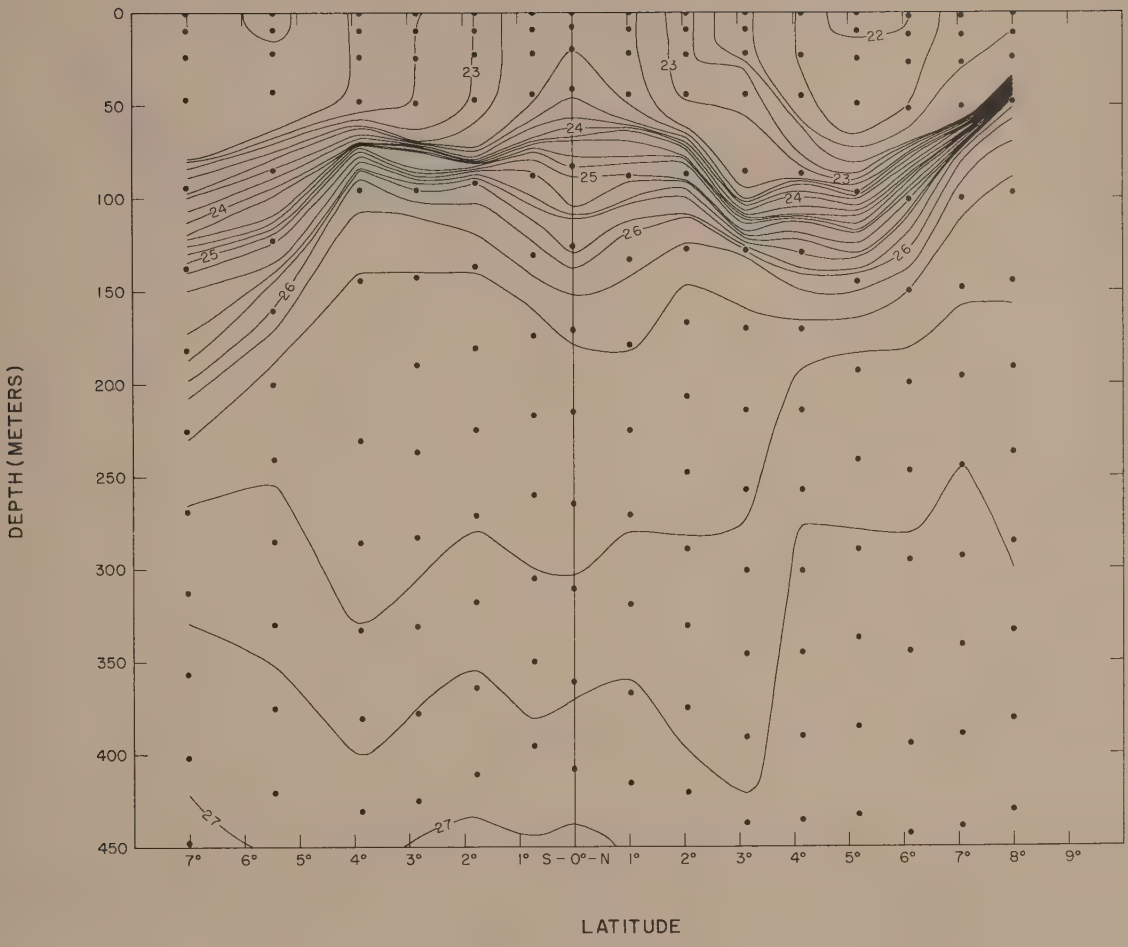


Fig. 9. -- Sigma-t. Northbound section along 140°W. longitude, 7°S. to 8°N., stations 17-31, June 3-8, 1952. Sigma-t, in grams per liter, isopleth interval 0.2 gm/l.

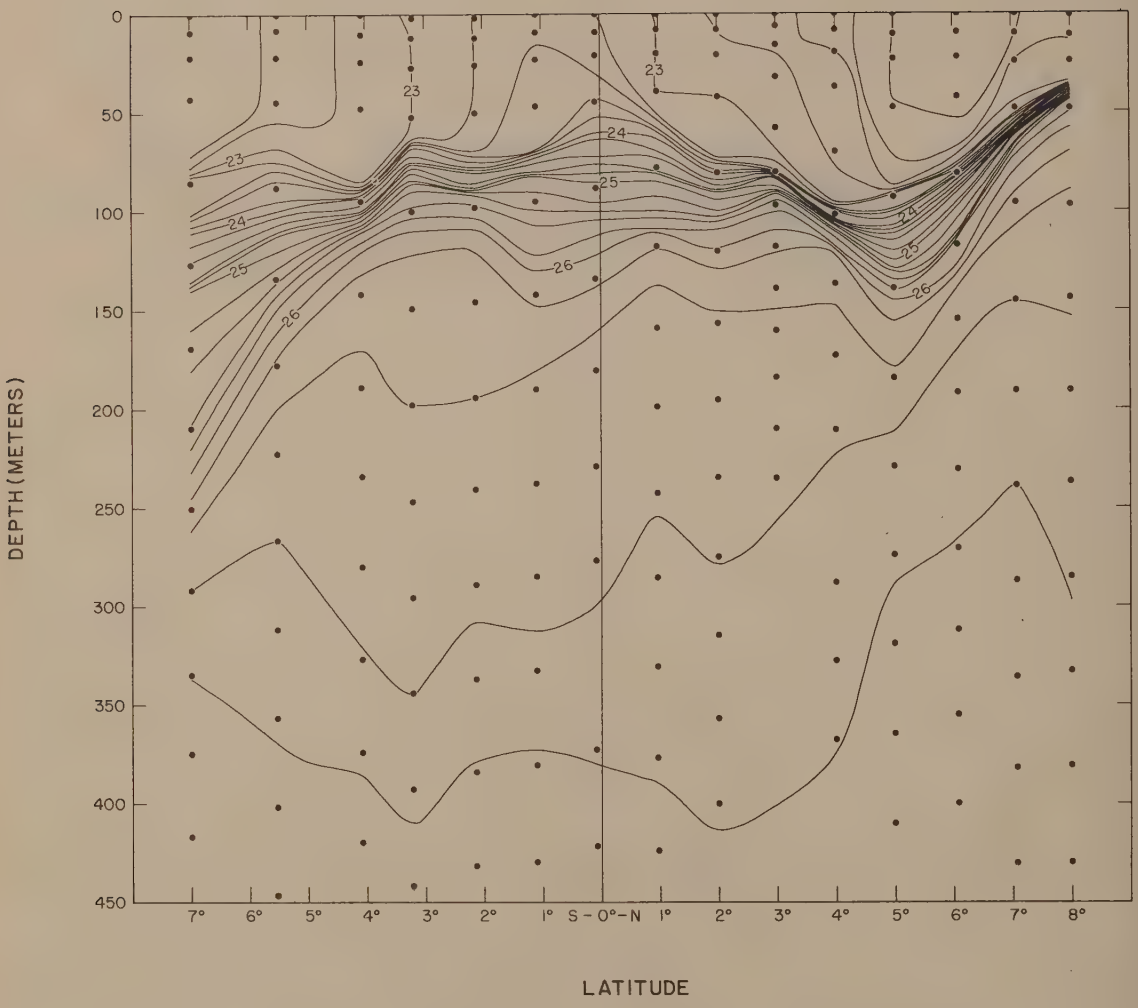


Fig. 10. -- Sigma-t. Southbound section along 140°W. longitude, 8°N. to 7°S., stations 31-45, June 8-14, 1952. Sigma-t in grams per liter, isopleth interval 0.2 gm/l.

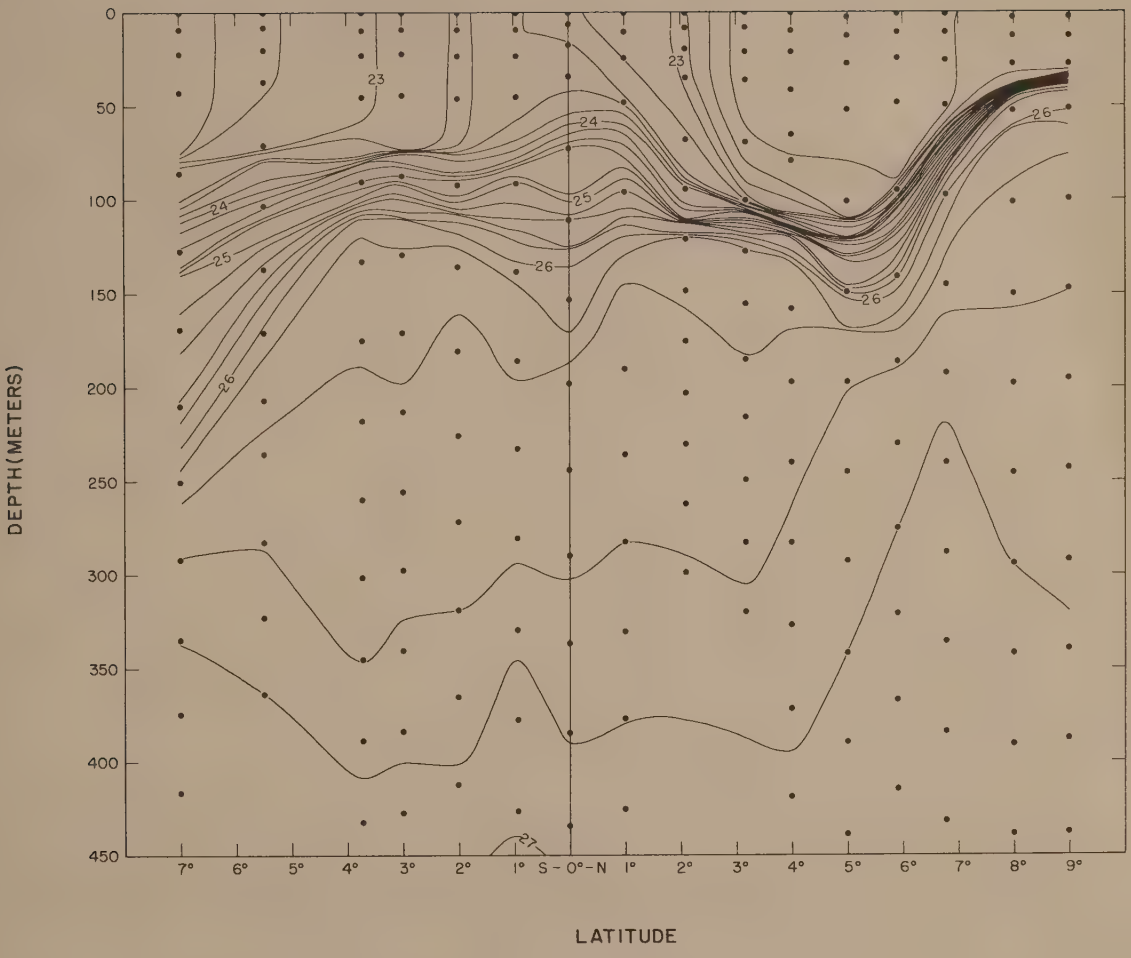


Fig. 11. -- Sigma-t. Northbound section along 140°W. longitude, 7°S. to 9°N, stations 45-60, June 14-20, 1952. Sigma-t in grams per liter, isopleth interval 0.2 gm/l.

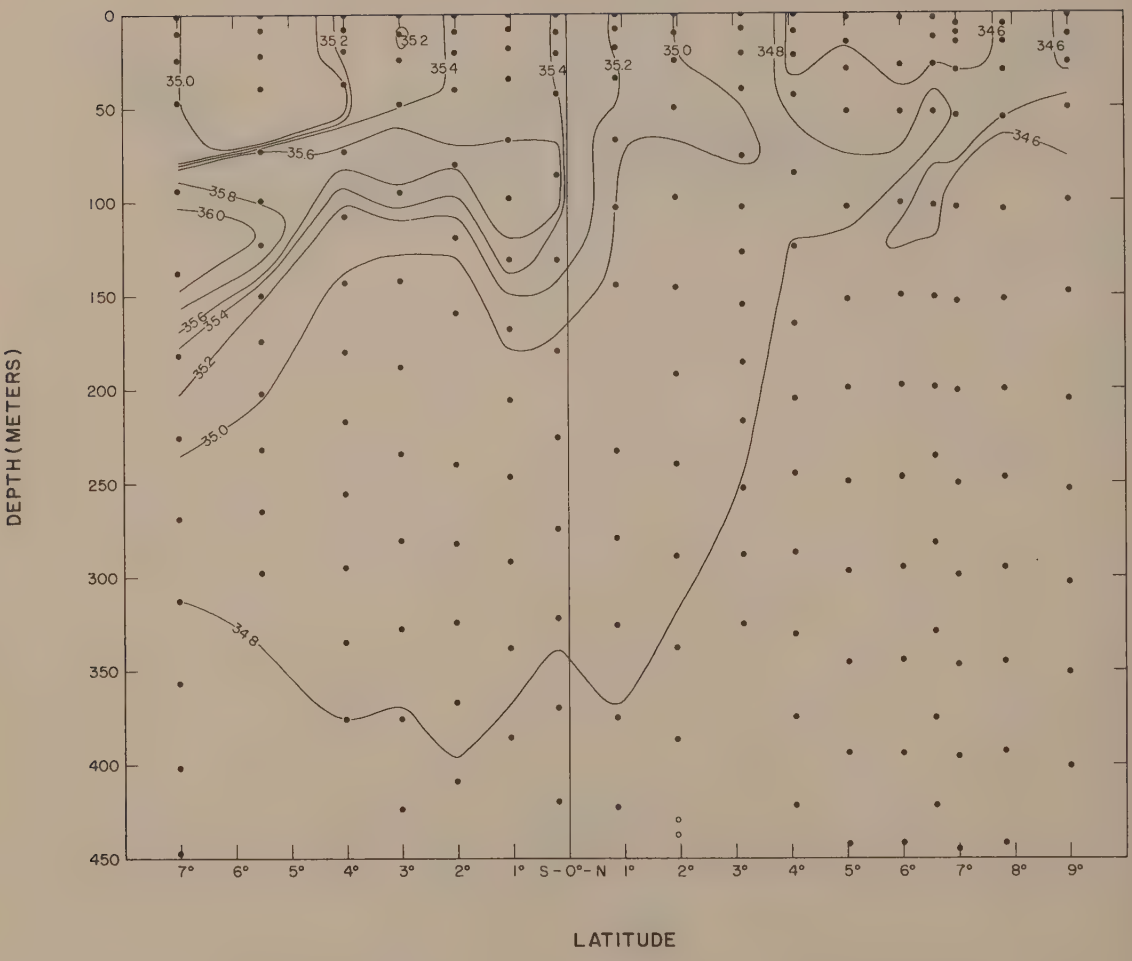


Fig. 12. -- Salinity. Southbound section along 140°W. longitude, 9°N. to 7°S., stations 1-17, May 28 - June 3, 1952. Salinity in parts per thousand, isohaline interval 0.2 °/oo.

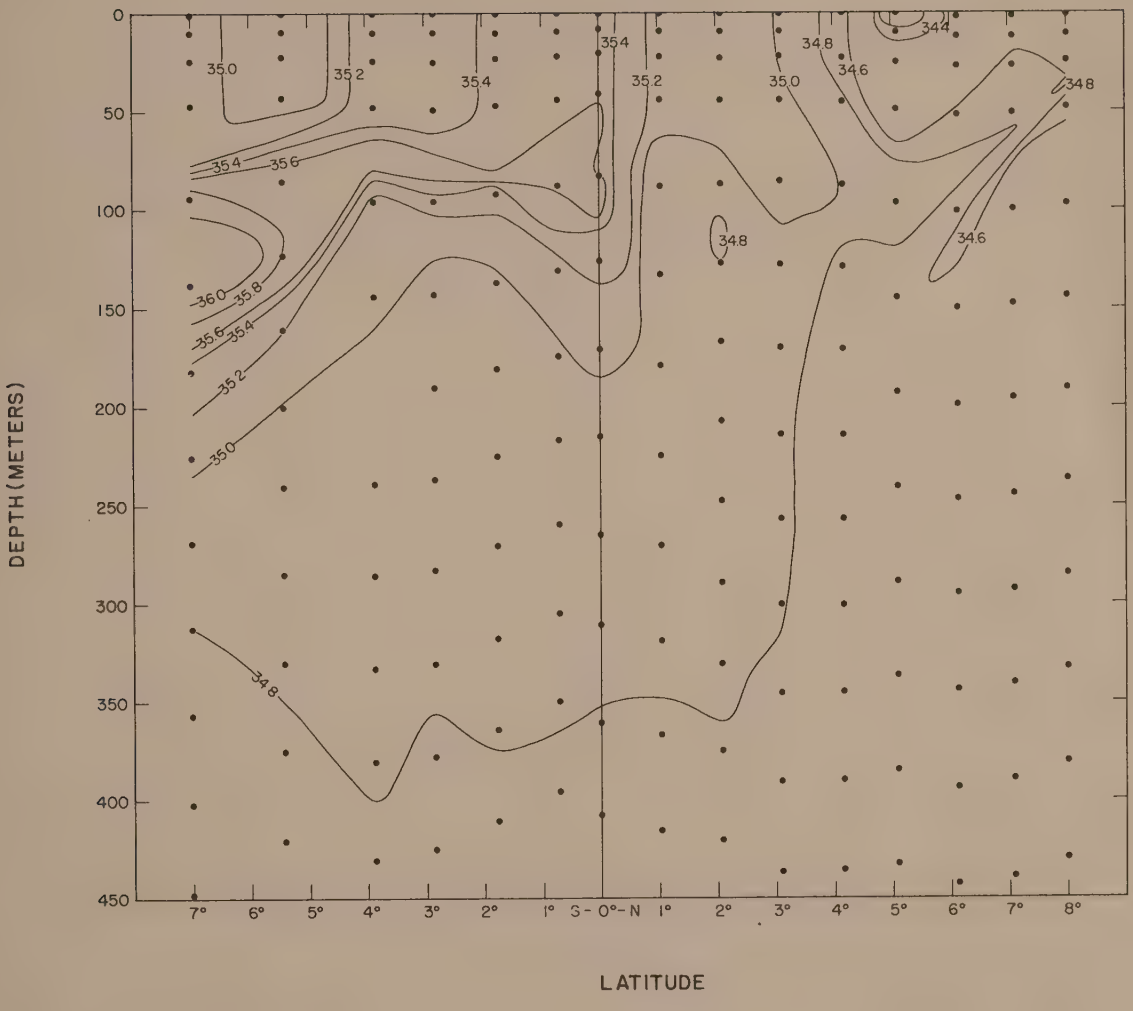


Fig. 13. -- Salinity. Northbound section along 140°W. longitude, 7°S. to 8°N, stations 17-31, June 3-8, 1952. Salinity in parts per thousand, isohaline interval 0.2 °/oo.

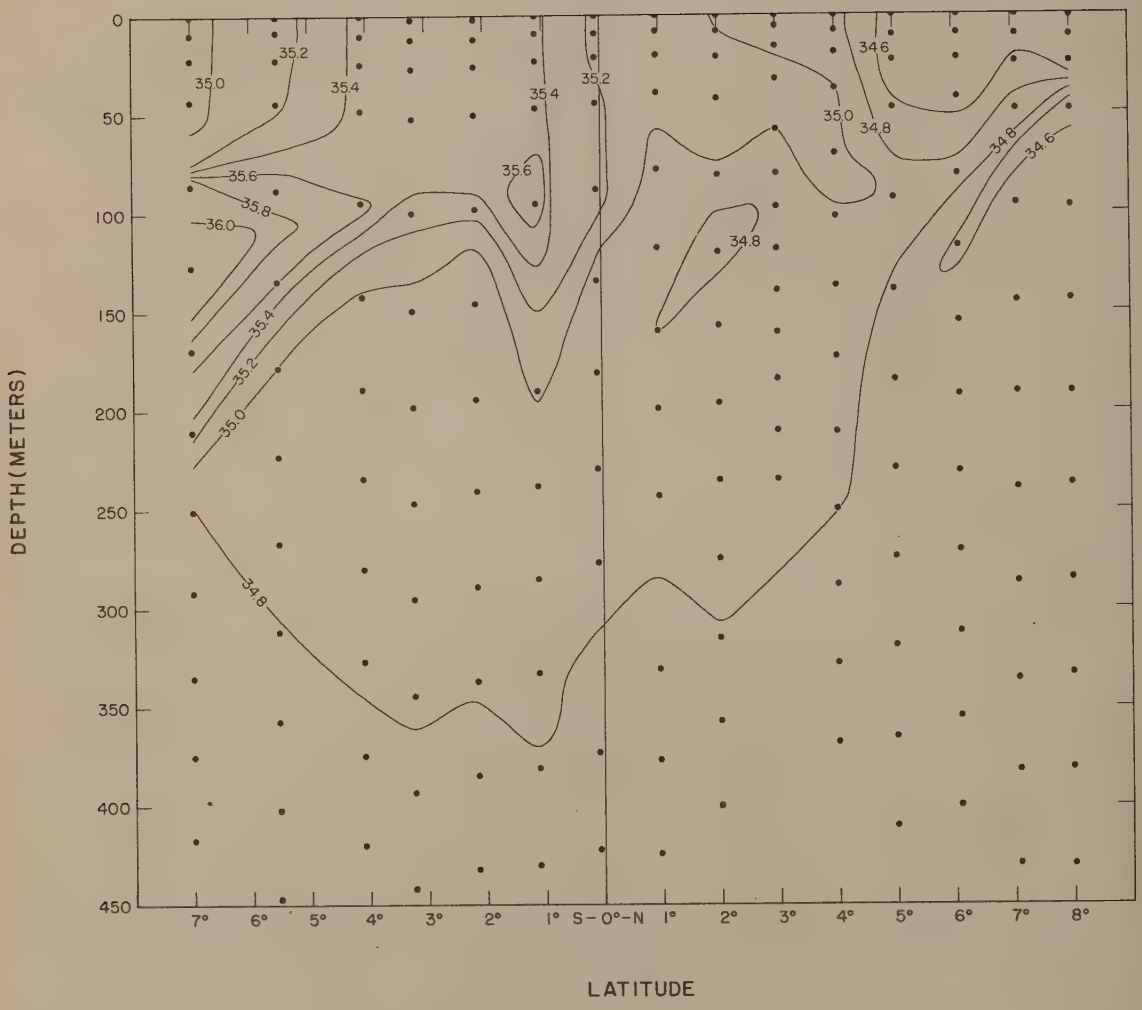


Fig. 14. -- Salinity. Southbound section along 140°W. longitude, 8°N. to 7°S., stations 31-45, June 8-14, 1952. Salinity in parts per thousand, isohaline interval 0.2 °/oo.

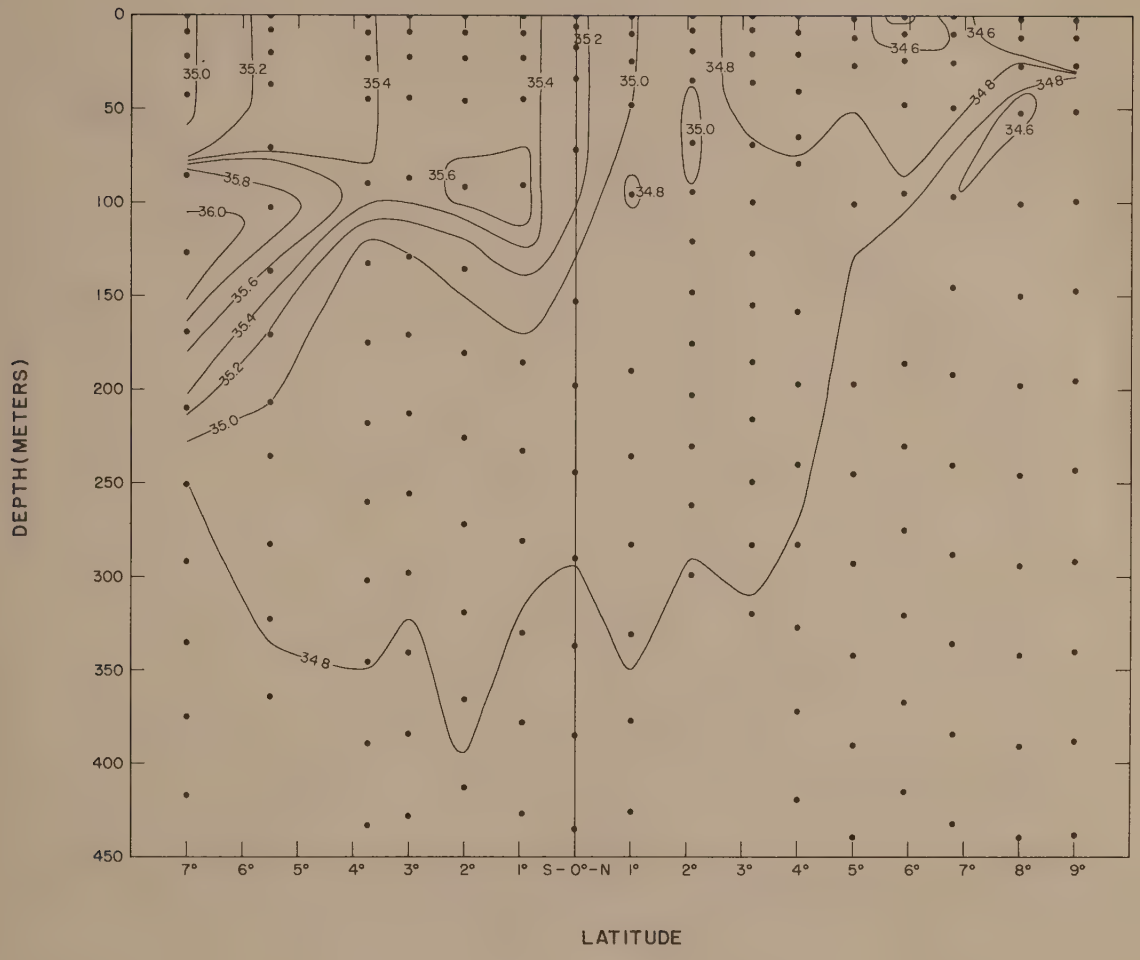


Fig. 15. -- Salinity. Northbound section along 140°W. longitude, 7°S. to 9°N, stations 45-60, June 14-20, 1952. Salinity in parts per thousand, isohaline interval 0.2 °/oo.

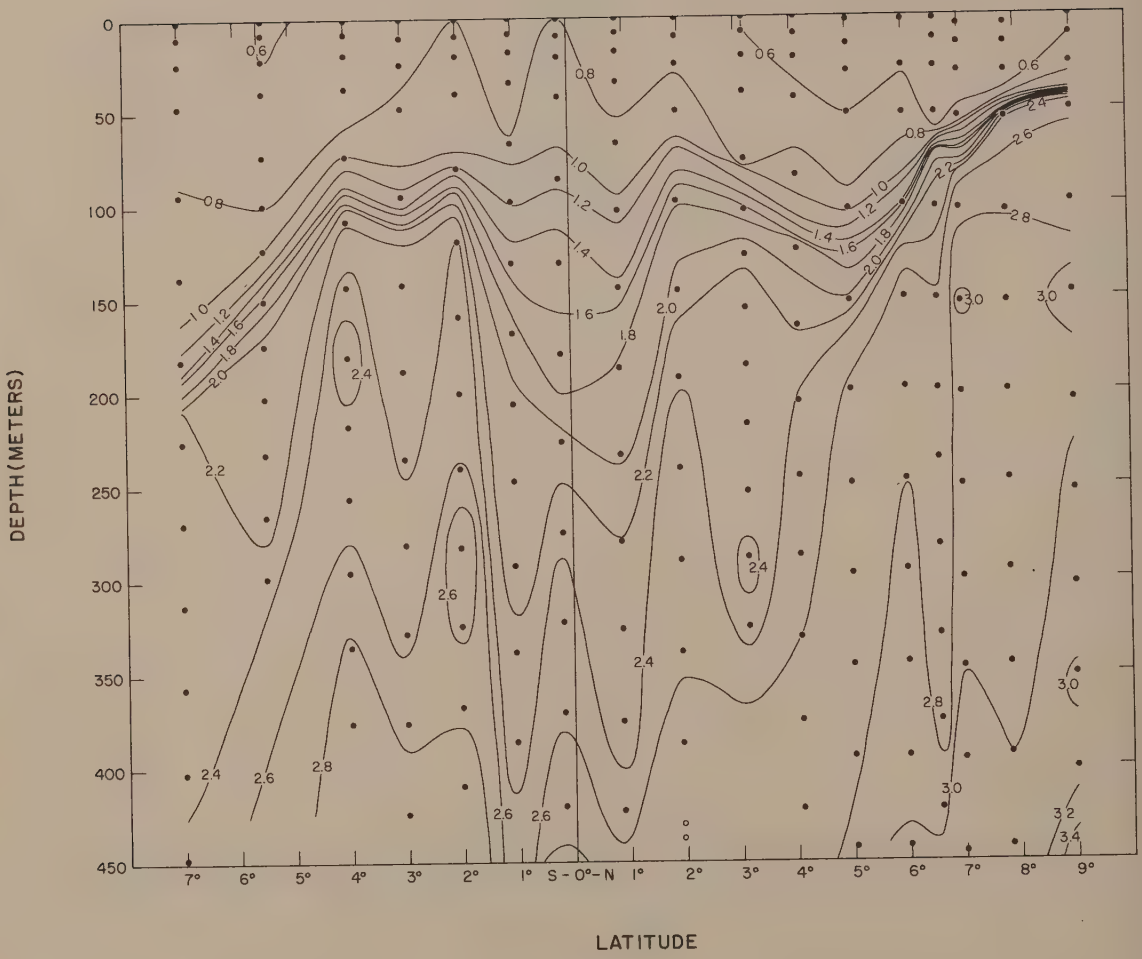


Fig. 16. -- Phosphate. Southbound section along 140°W. longitude, 9°N. to 7°S., stations 1-17, May 28 - June 3, 1952. Phosphate in microgram atoms per liter, isopleth interval 0.2 μg at/l.

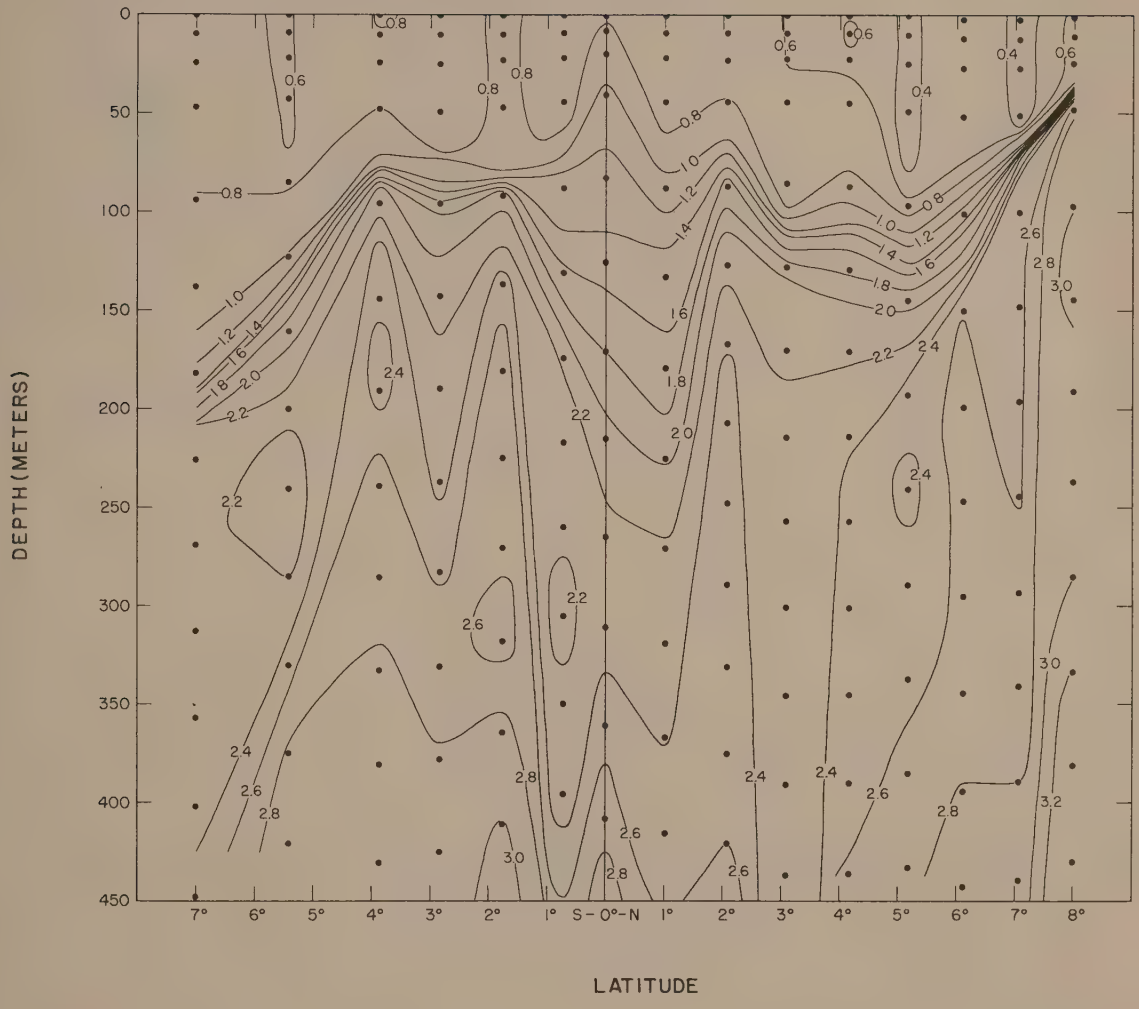


Fig. 17. -- Inorganic phosphate. Northbound section along 140°W. longitude, 7°S. to 8°N., stations 17-31, June 3-8, 1952. Phosphate in microgram atoms per liter, isopleth interval 0.2 μg at/l.

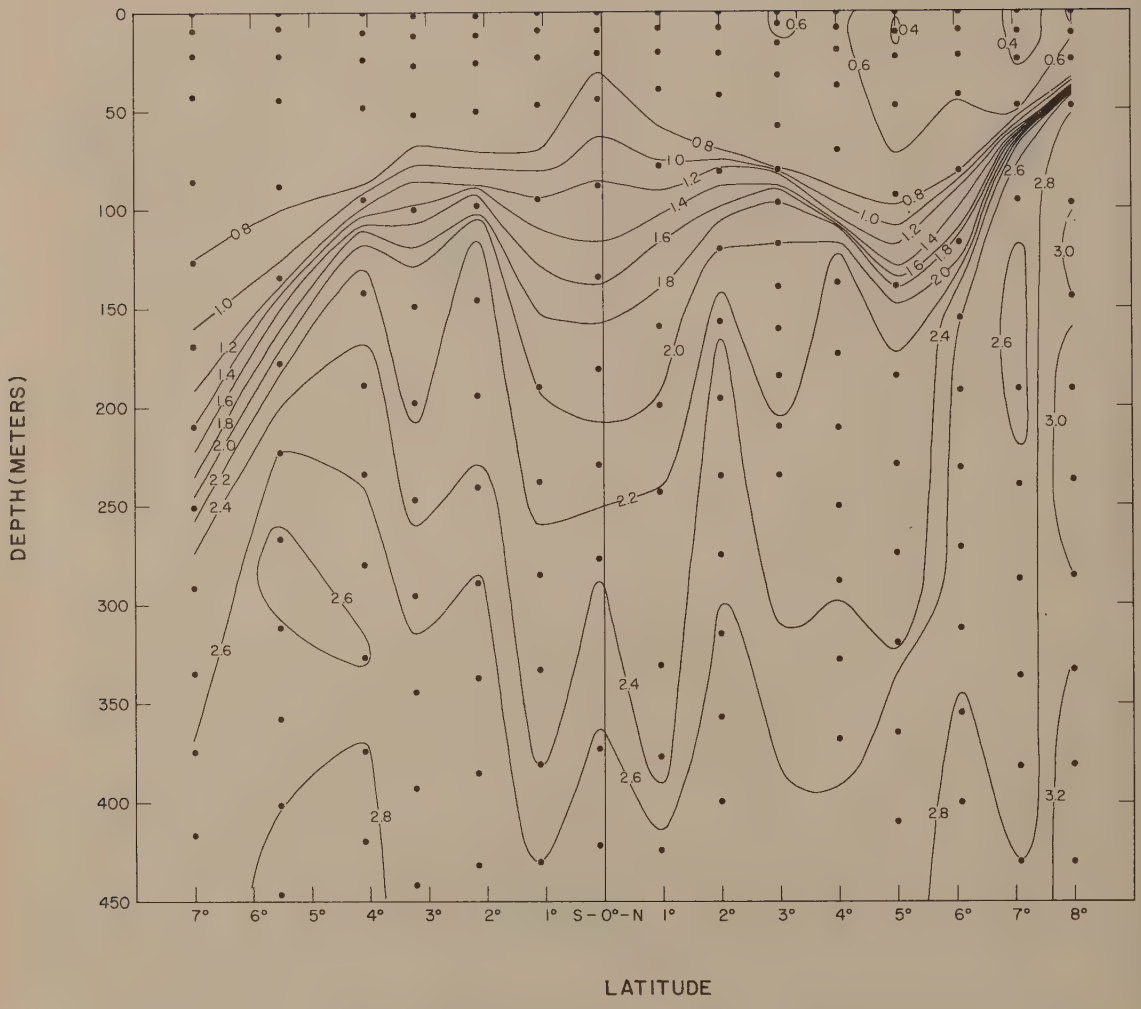


Fig. 18. -- Inorganic phosphate. Southbound section along 140°W. longitude, 8°N. to 7°S., stations 31-45, June 8-14, 1952. Phosphate in microgram atoms per liter, isopleth interval 0.2 μg at/l.

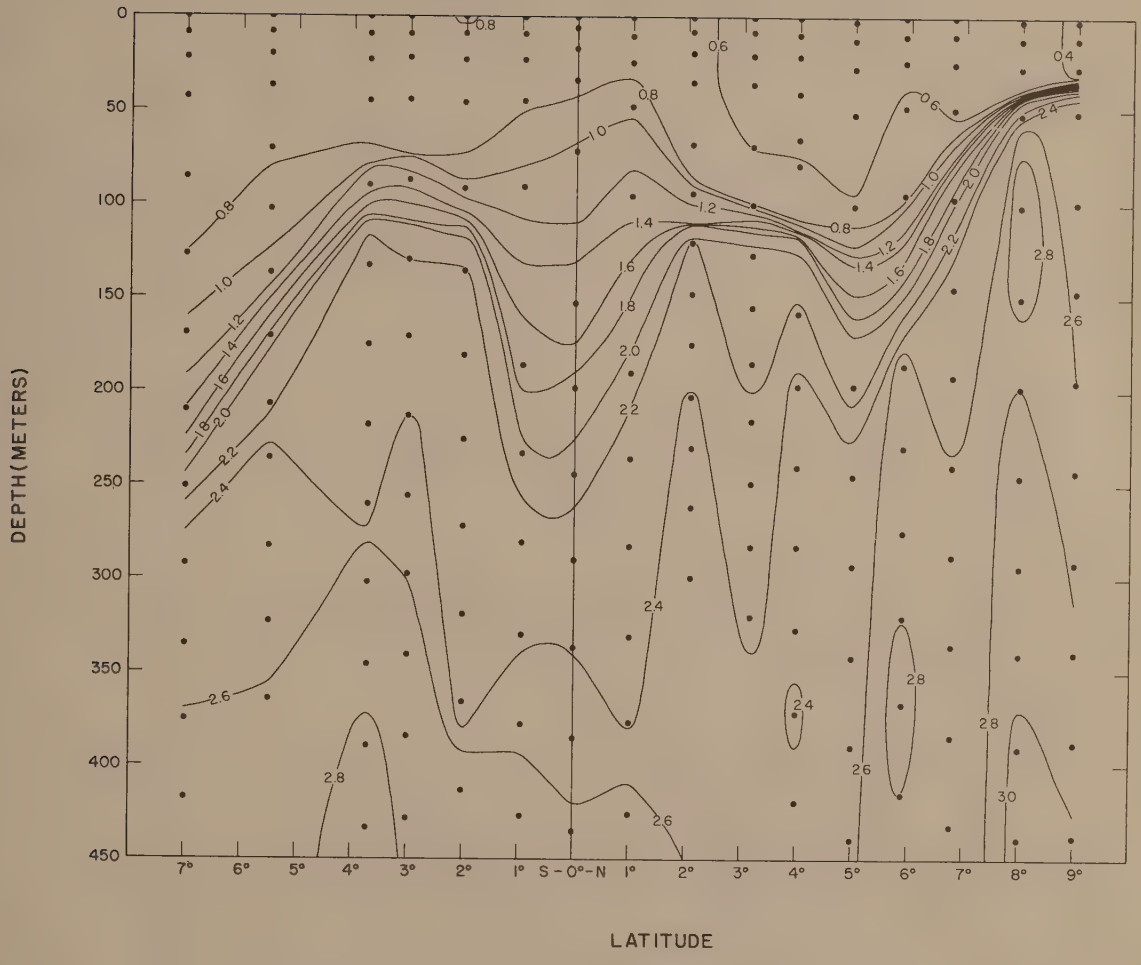


Fig. 19. -- Phosphate. Northbound section along 140°W. longitude, 7°S. to 9°N, stations 45-60, June 14-20, 1952. Phosphate in microgram atoms per liter, isopleth interval 0.2 μg at/l.

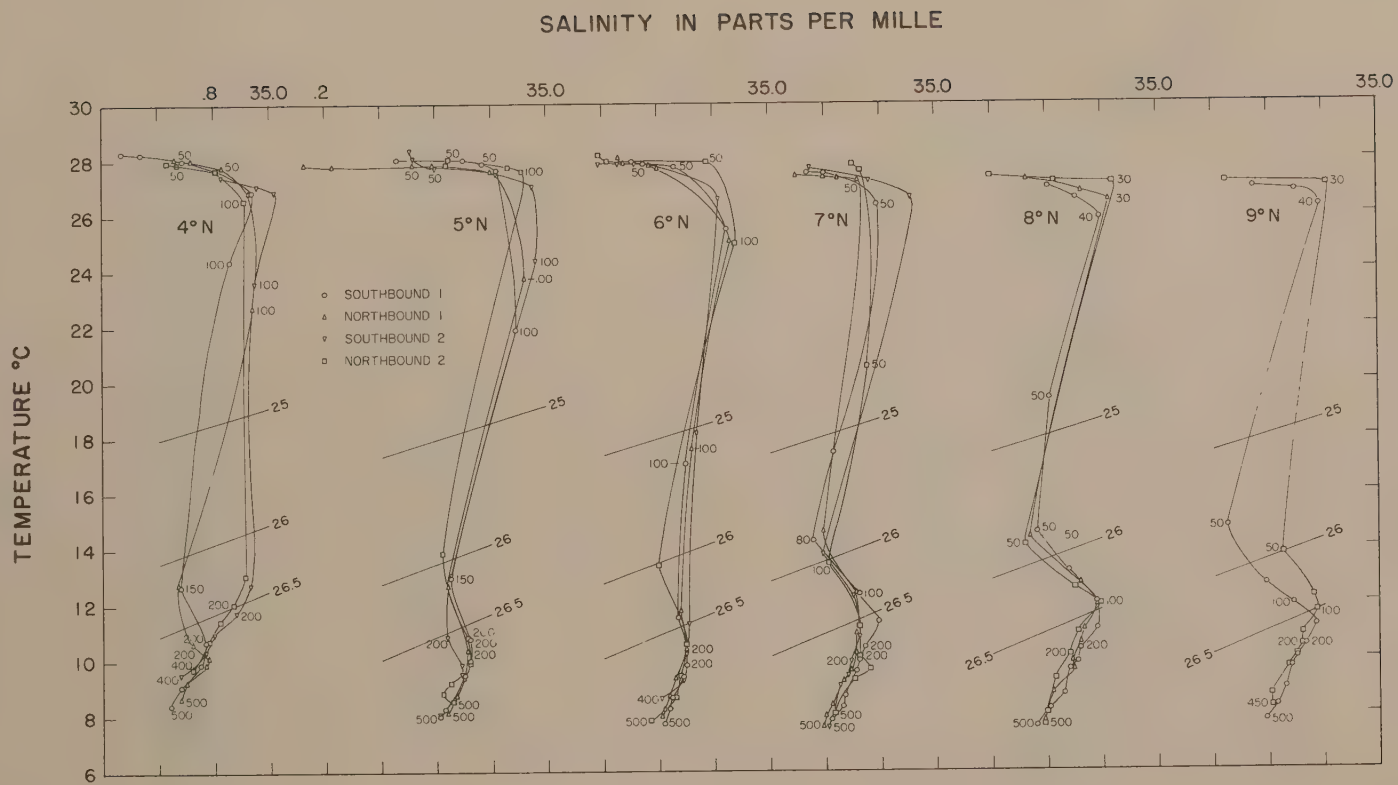


Fig. 20A. -- Temperature-salinity curves. May 28 - June 20, 1952. T-S curves for stations along each of the four legs, 9°N. to 7°S. along 140°W. longitude, have been grouped according to latitude.

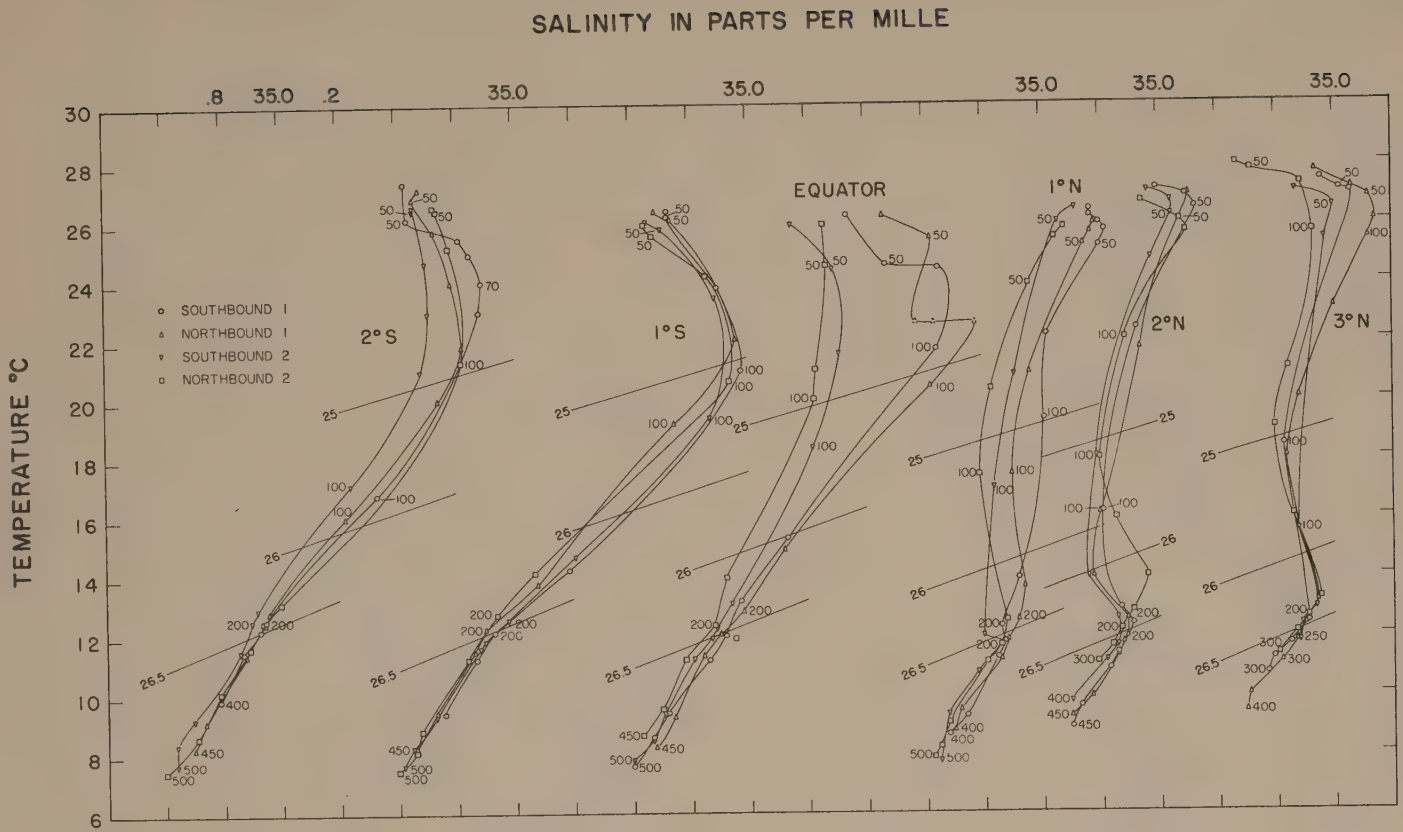


Fig. 20B. -- Temperature-salinity curves. May 28 - June 20, 1952. T-S curves for stations along each of the four legs, 9°N. to 7°S. along 140°W. longitude, have been grouped according to latitude.

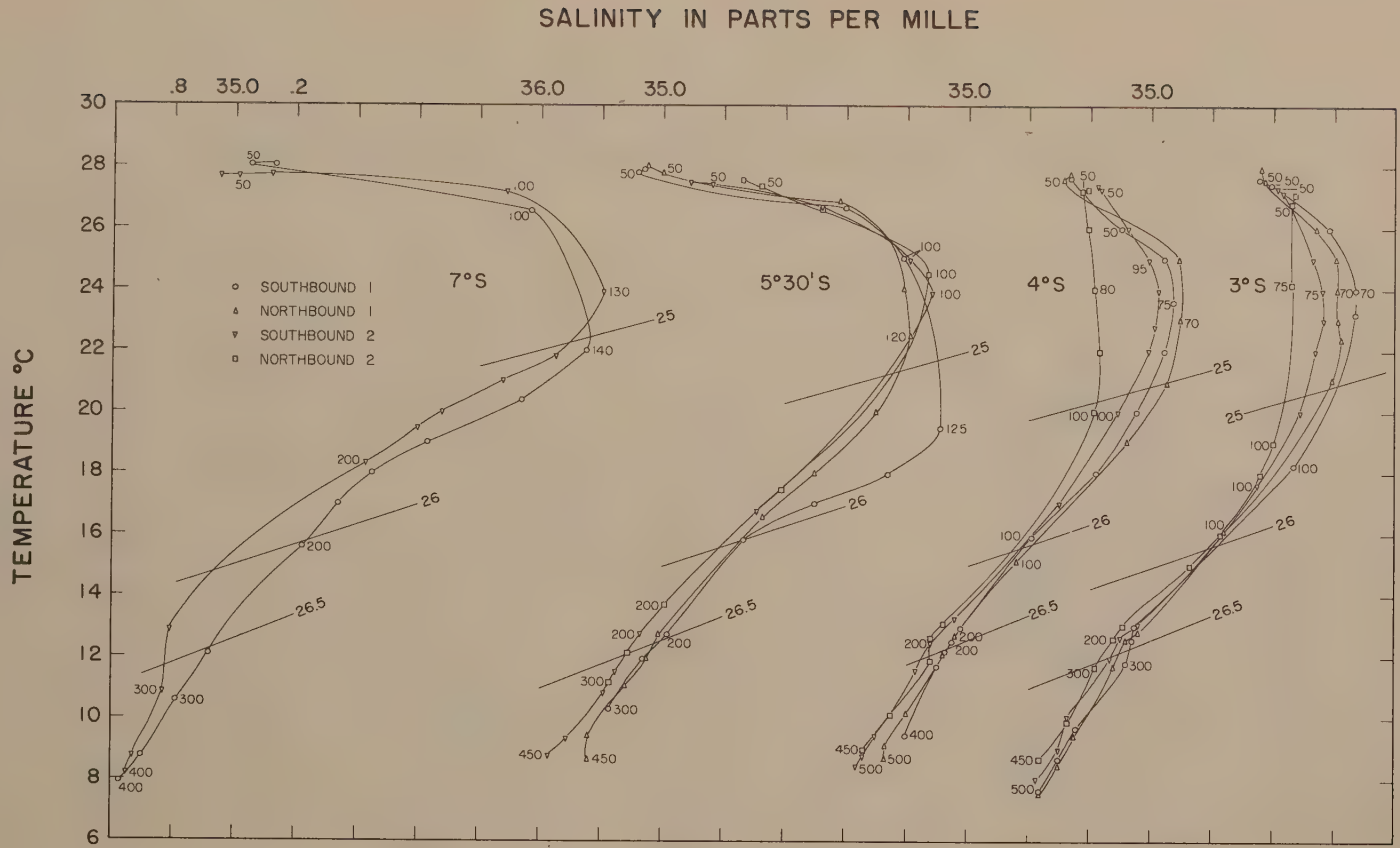
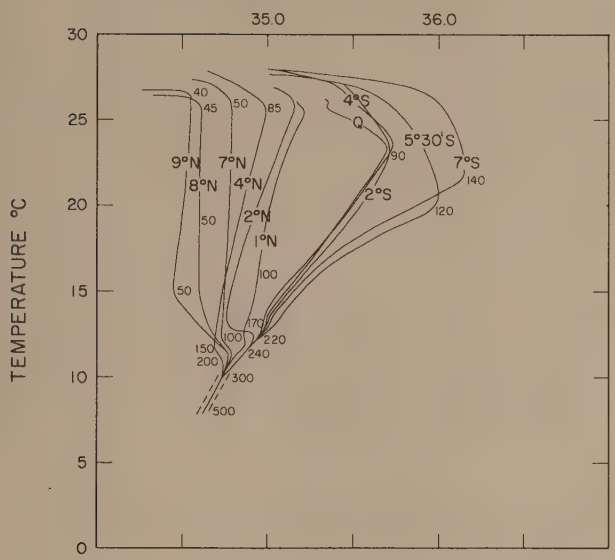
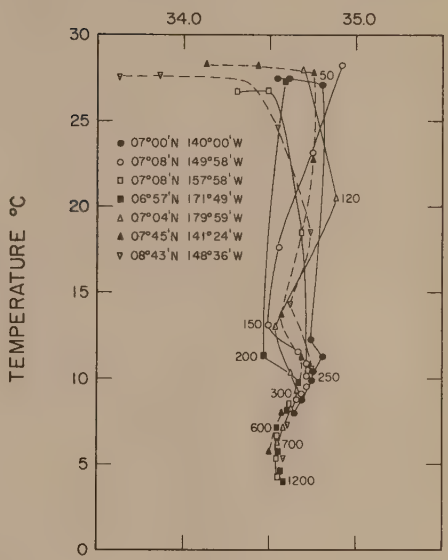


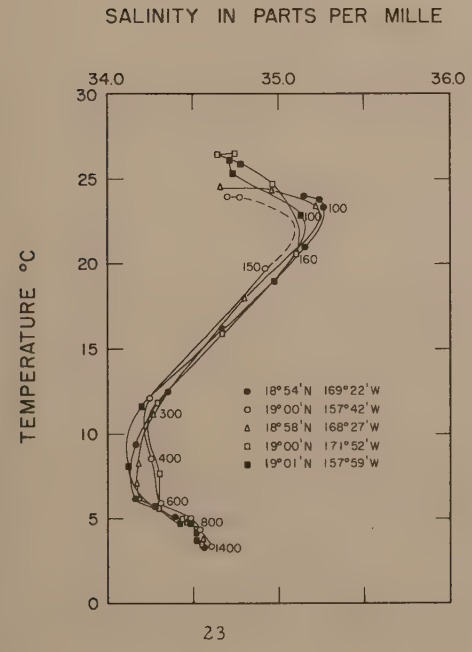
Fig. 20C. -- Temperature-salinity curves. May 28 - June 20, 1952. T-S curves for stations along each of the four legs, 9°N. to 7°S. along 140°W. longitude, have been grouped according to latitude.



21



22



23

Fig. 21. -- Temperature-salinity curves, surface to 500 meters for selected stations from southbound leg, Hugh M. Smith cruise 15, stations 1-17, May 28 - June 3, 1952.

Fig. 22. -- Temperature-salinity curves for stations at 7°N. latitude and for various longitudes between 140°W. and 180th meridian. The two curves from vessels other than those operated by POFI are from the cruises of the Carnegie (Fleming et al. 1945) and the Albatross (Jerlov 1953).

Fig. 23. -- Temperature-salinity curves for stations at 19°N. latitude and for various longitudes between 158°W. and 171°W. longitudes.

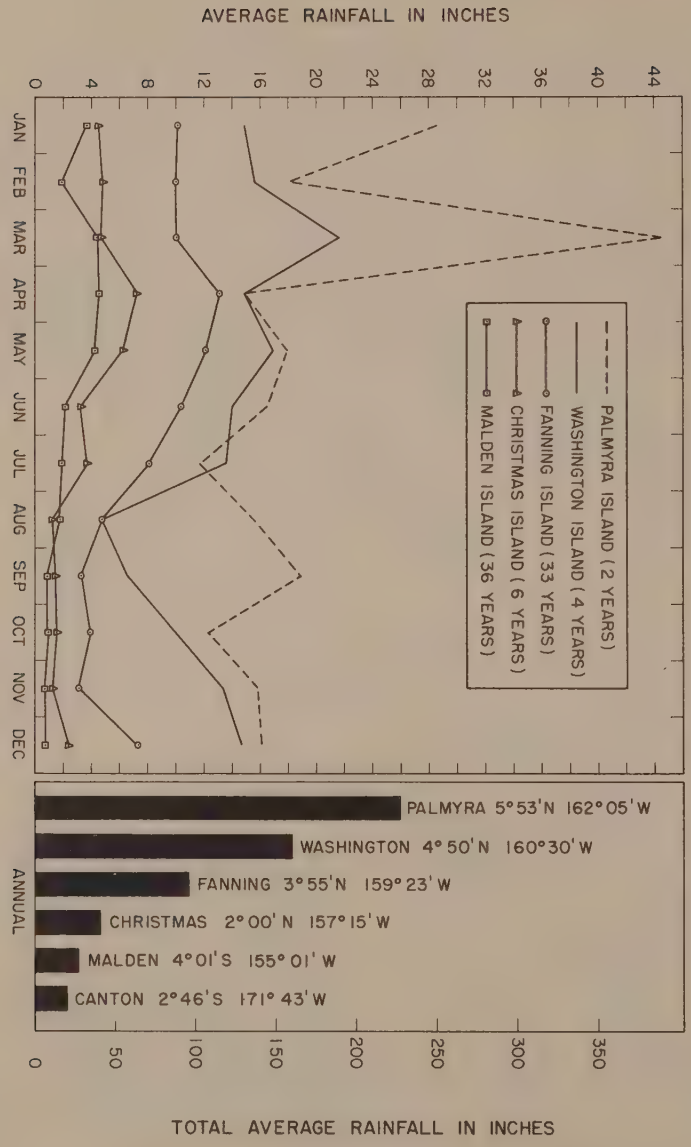
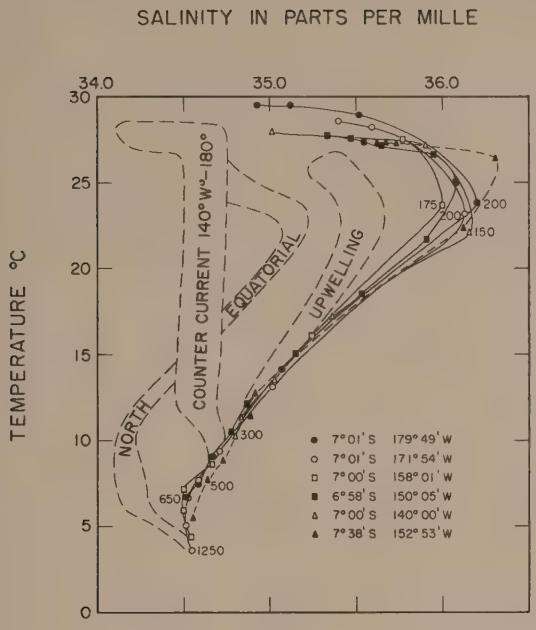
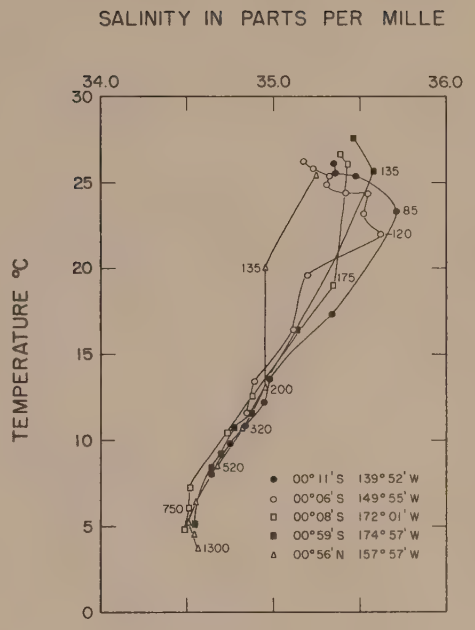


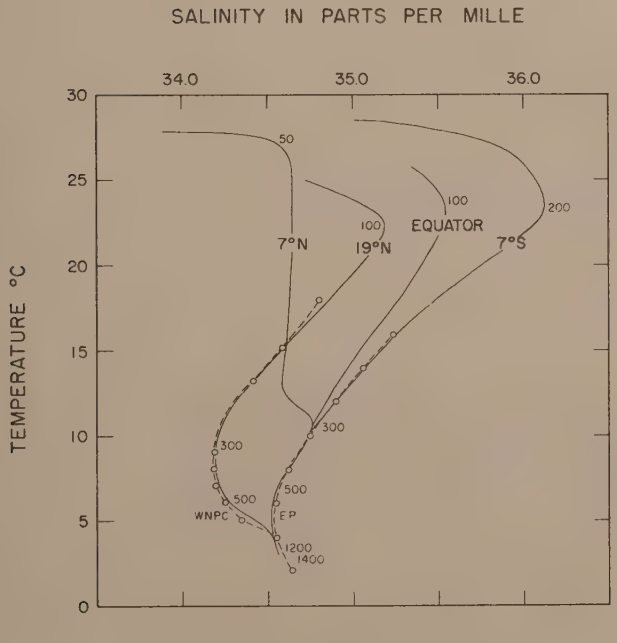
Fig. 24. -- Average monthly and annual rainfall for Palmyra, Washington, Fanning, Christmas, Malden, and Canton islands.



25



26



27

Fig. 25. -- Temperature-salinity curves for stations at 7°S. latitude and for various longitudes between 140°W. and 180th meridian. One curve shown is from a station made by the Albatross (Jerlov 1953).

Fig. 26. -- Temperature-salinity curves for stations near the Equator and on various longitudes between 140°W. and 180th.

Fig. 27. -- Average temperature-salinity curves for stations at 19°N., 7°N., the Equator, and 7°S., between longitudes 140°W. and the 180th meridian. The dashed lines are T-S curves for Western North Pacific Central and Equatorial Pacific waters (Sverdrup et al. 1942).

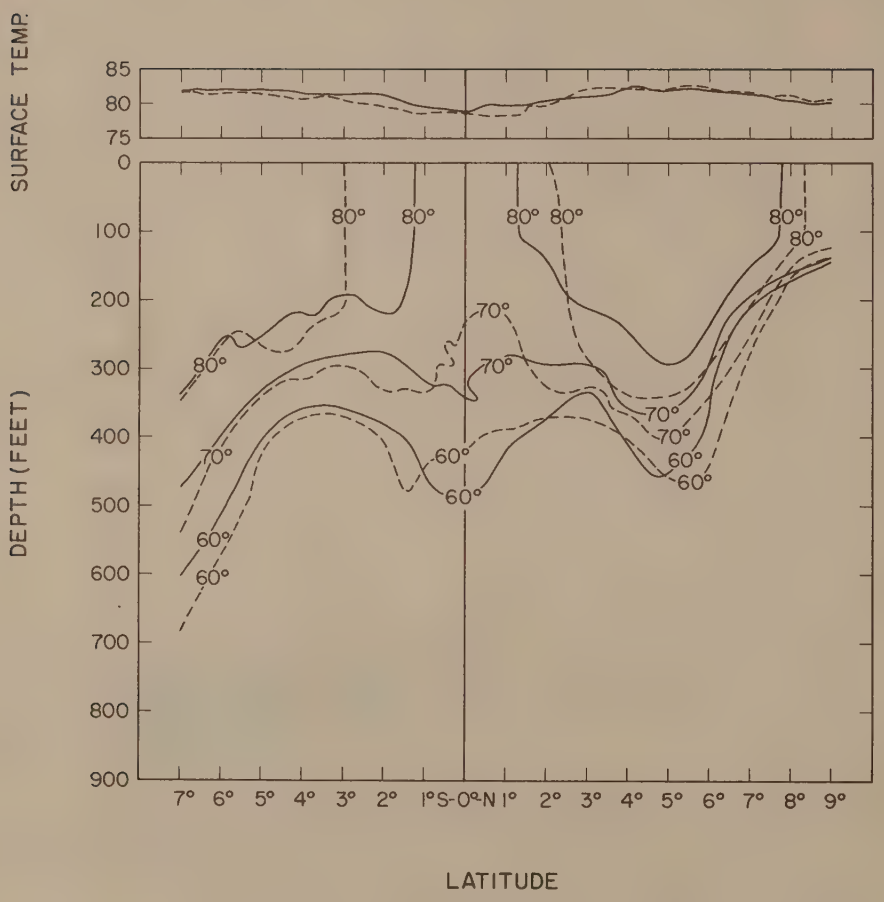


Fig. 28. -- Upper panel. Surface temperatures, first leg (solid curves) and fourth leg (broken curve) of Hugh M. Smith cruise 15. Lower panel. Smoothed (by inspection) 60°, 70°, and 80° isotherms for the first leg (stations 1-17, May 28 - June 3, 1952, solid curves) and fourth leg (stations 45-60, June 14-20, 1952, broken curves) of Hugh M. Smith cruise 15.

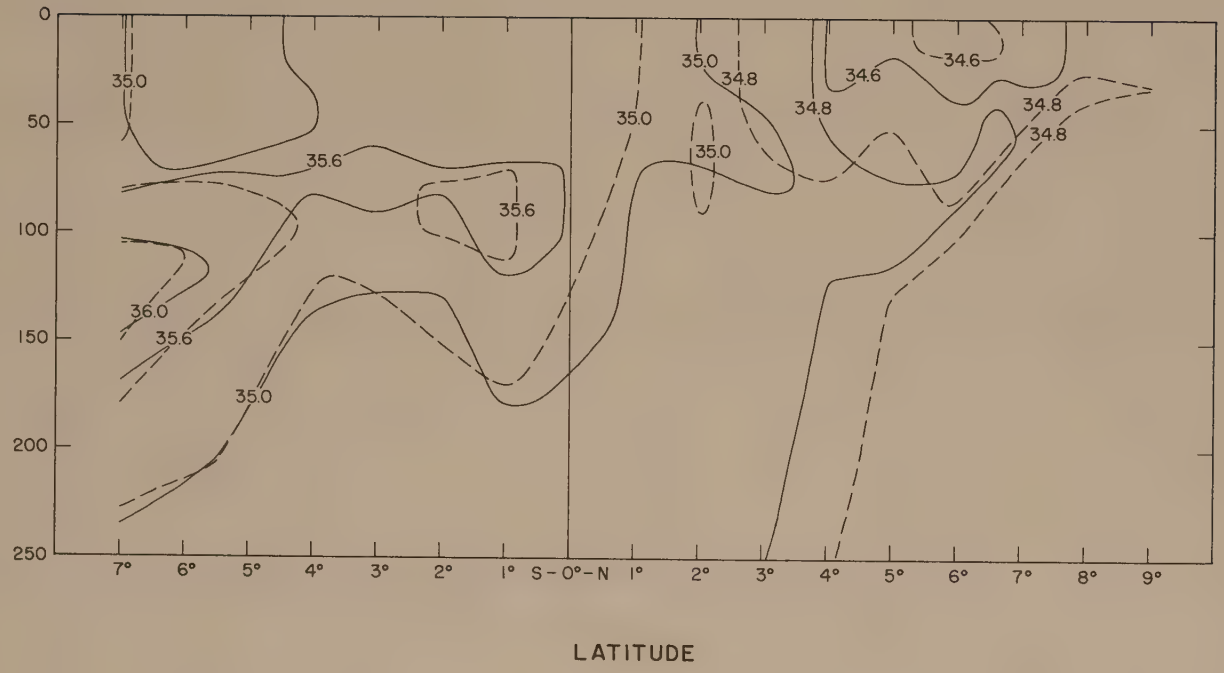


Fig. 29. -- Selected isohalines, first leg (stations 1-17, May 28 - June 3, 1952, solid curve) and the fourth leg (stations 45-60, June 14-20, 1952, broken curve) from Hugh M. Smith cruise 15. Salinity in parts per thousand.

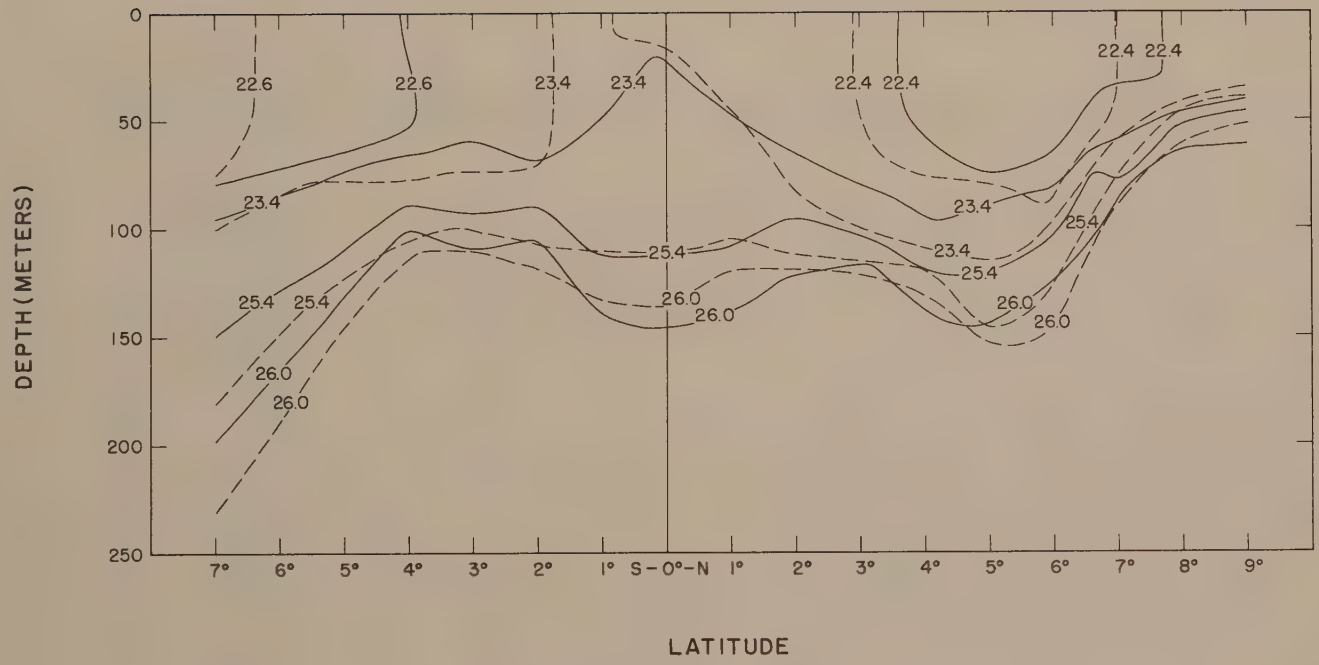


Fig. 30. -- Selected sigma-t surfaces, first leg (stations 1-17, May 28 - June 3, 1952, solid curves) and the fourth leg (stations 45-60, June 14-20, 1952, broken curve) of Hugh M. Smith cruise 15. Sigma-t in grams per liter.

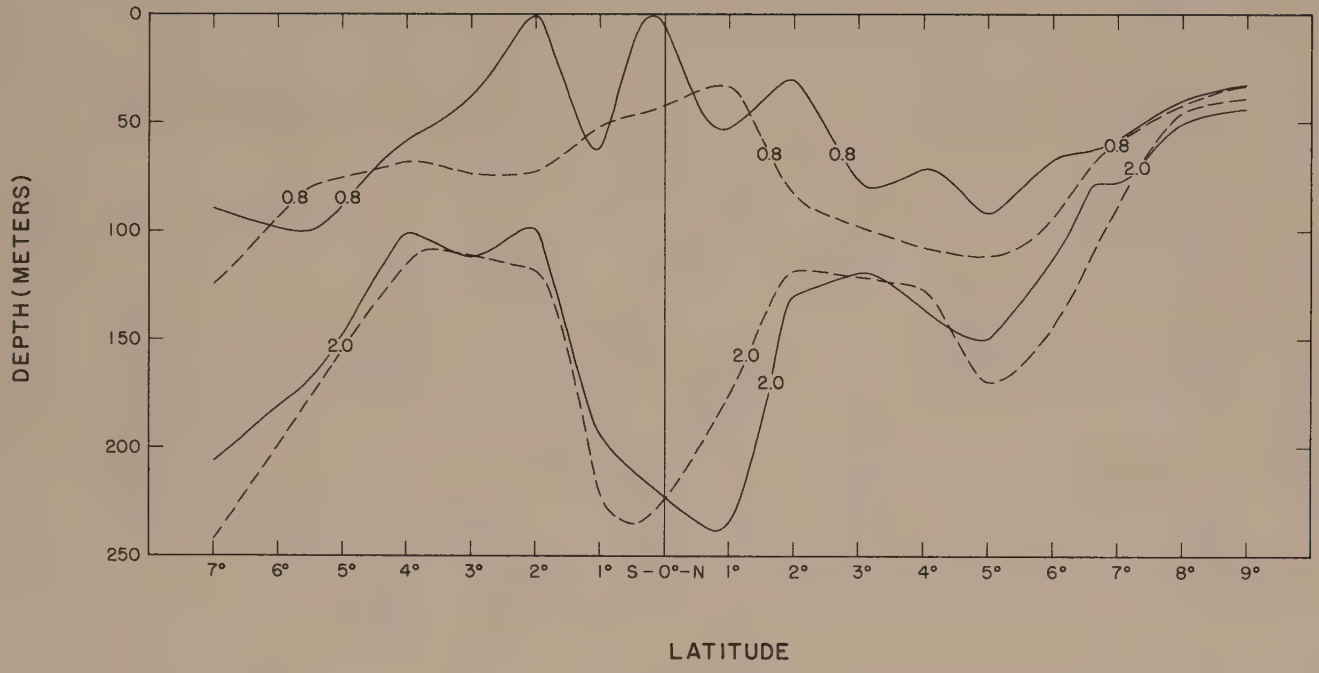


Fig. 31. -- Selected phosphate isopleths, first leg (stations 1-17, May 28 - June 3, 1952, solid curve) and the fourth leg (stations 45-60, June 14-20, 1952, broken curve) from Hugh M. Smith cruise 15. Inorganic phosphate in microgram atoms per liter.

Notes on the tabulated data, Hugh M. Smith cruise 15

1. Weather was recorded according to the ww (present weather) code in the U. S. Weather Bureau, Circular M, 8th edition, Manual of Marine Meteorological Observations.

2. The wind velocity was measured with an anemometer 30 M above the sea surface. The speed is recorded in knots; the direction in degrees true.

3. Any departure from the POFI standard 13-bottle cast is explained in a footnote.

4. If a value is definitely determined to be in error, it is deleted from the tabulations and an explanatory footnote appended. If a value appears to be anomalous, but there is uncertainty, the value is carried with a footnote.

5. Horizontal line(s) separating particular depths denotes more than one cast. The time and wire angle for each cast is carried in the station headings.

STATION 1

M/V Hugh M. Smith: Cruise 15, 8°59'N, 139°56'W., May 28, 1952.
Messenger time: first cast 1540 GCT, second cast 1605 GCT.
Weather: 50, cloud coverage 9. Wind: 040°, 21 kt. Sea: 5-8 ft.
Wire angle: first cast 12°, second cast 12°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
01	26.86	34.55	22.45		0.46
11	26.84	34.53	22.44		0.54
26	26.82	34.53	22.44		0.78
50	14.70	34.45	25.63		2.53
99	11.91	34.69	26.39		2.71
148	11.18	34.77	26.58		3.06
205	10.36	34.72	26.69		2.91
253	9.98	34.70	26.74		3.09
303	9.66	34.69	26.79		3.12
351	9.35	34.67	26.82		2.99
401	8.90	34.66	26.89		3.11
451	8.28	34.63	26.96		3.48
500	7.74	34.59	27.01		3.27

STATION 2

M/V Hugh M. Smith: Cruise 15, 7°51'N, 139°46'W., May 29, 1952. Messenger time: 0105 GCT. Weather: 01, cloud coverage 5. Wind: 050°, 18 kt. Sea: 5-8 ft. Wire angle: 05°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
05	26.90	34.61	22.48		0.43
15	26.90	34.61	22.48		0.39
30	26.82	34.62	22.51		0.40
55	15.32	34.60	25.61		2.40
104	11.86	34.79	26.47		2.68
152	10.98	34.78	26.63		2.74
200	10.31	34.72	26.70		2.40
200 2/					2.52 1/
247	9.92	34.71	26.76		2.76
295	9.64	34.70	26.80		2.76
345	9.26	34.67	26.84		2.66
345					2.74 1/
393	8.76	34.66	26.91		3.03
442	8.26	34.62	26.96		3.04
493	7.63	34.57	27.01		3.17
542					

1/ Double value when analyses disagreed by 0.05 µg at/l.

2/ Erratic unprotected thermometer, second depth determined from L-Z curve.

STATION 3

M/V Hugh M. Smith: Cruise 15, 7°00'N, 140°00'W., May 29, 1952. Messenger time: 1120 GCT. Weather: 02, cloud coverage not recorded. Wind: 050°, 18 kt. Sea: 5-8 ft. Wire angle: 00°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
05	27.47	34.54	22.24		0.48
15	27.46	34.53	22.24		0.54
30	27.42	34.60	22.30		0.54
54	26.10	34.79	22.87		0.63
103	12.26	34.72	26.34		2.70
153	11.28	34 79	26.58		3.02
201	10.42	34.74	26.70		2.72
250	9.98	34.72	26.76		2.90
299	9.59	34.71	26.81		2.91
347	9.15	34.69	26.87		3.00
396	8.73	34.67	26.92		3.10
445	8.36	34.66	26.97		3.12
495	7.90	34.62	27.01		3.29

STATION 4

M/V Hugh M. Smith: Cruise 15, 6°36'N, 139°44'W., May 29, 1952. Messenger time: first cast 1848 GCT, second cast 1914 GCT. Weather: 01, cloud coverage 5. Wind: 040°, 14 kt. Sea: 3-5 ft. Wire angle: first cast 04°, second cast 12°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
02	27.71	34.60	22.21		0.45
12	27.69	34.60	22.22		0.48
27	27.64	34.60	22.23		0.41
52	27.04	34.89	22.64		0.53
102	13.46	34.55	25.97		2.06
151	11.20	34.72	26.54		2.62
199	10.17	34.70	26.71		2.70
236	9.76	34.70	26.78		2.61
236					2.66
282	9.32	34.69	26.84		2.65
329	9.06	34.69	26.89		2.66
375	8.72	34.66	26.92		2.73
422	8.32	34.64	26.96		2.88
470	7.84	34.64	27.03		2.91

STATION 5

M/V Hugh M. Smith: Cruise 15, 6°00'N, 140°00'W., May 30, 1952. Messenger time: 0202 GCT. Weather: 02, cloud coverage 6. Wind: 070°, 13 kt. Sea: 3-5 ft. Wire angle: 00°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
02	27.91	34.51	22.08		0.47
12	27.87	1/			
27	27.83	34.54	22.13		0.56
52	27.72	34.66	22.25		0.75
101	17.06	34.70	25.29		1.54
150	11.52	34.67	26.44		2.72
198	10.34	34.70	26.68		2.76
247	9.87	34.70	26.76		2.79
295	9.50	34.69	26.81		2.81
344	9.17	34.67	26.85		2.92
394	8.73	34.66	26.92		2.91
442	8.33	34.64	26.96		3.04
491	7.86	34.63	27.02		3.10

1/ No sample.

STATION 6

M/V Hugh M. Smith: Cruise 15, 5°02'N, 139°58'W., May 30, 1952. Messenger time: 1035 GCT. Weather: 50, cloud coverage not recorded. Wind: 030° (variable), 8 kt. Sea: 1-3 ft. Wire angle: 03°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
02	28.03	34.46	22.00		0.45
15	28.04	34.51	22.04		0.48
29	27.96	34.75	22.24		0.53
52	27.87	34.77	22.29		0.60
103	21.10	34.88	24.39		0.97
152	12.78	34.65	26.18		2.05
199	10.80	34.72	26.61		2.65
249	10.00	34.72	26.75		2.71
297	09.50	34.70	26.82		2.58
346	09.12	34.68	26.87		2.69
394	08.78	34.66	26.91		2.75
443	08.34	34.63	26.95		2.92
492	08.04	34.61	26.98		2.90

STATION 7

M/V Hugh M. Smith: Cruise 15, 4°05'N, 139°58'W., May 30, 1952. Messenger time: 1835 GCT. Weather: 03, cloud coverage 7. Wind: 180°, 9 kt. Sea: 1-3 ft. Wire angle: 30°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	28.25	34.47	21.94		0.43
09	28.24	34.45	21.92		0.48
22	28.24	34.49	21.95		0.55
43	28.03	34.65	22.14		0.63
85	25.94	34.97	23.05		0.94
124	16.73	34.77	25.42		1.84
165	11.52	34.66	26.43		2.17
205	10.72	34.77	26.67		2.42
245	10.29	34.77	26.74		2.54
287	10.03	34.76	26.78		2.54
331	09.54	34.70	26.81		2.60
375	09.30	34.69	26.85		2.71
422	08.94	34.68	26.90		2.73

STATION 8

M/V Hugh M. Smith: Cruise 15, 3°09'N, 139°53'W., May 31, 1952.
Messenger time: 0310 GCT. Weather: 01, cloud coverage 3.
Wind: 180°, 4 kt. Sea: 1-3 ft. Wire angle: 35°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.38	34.96	22.59		0.60
08	27.36	34.96	22.60		0.60
21	27.10	34.97	22.69		0.64
40	27.06	34.98	22.70		0.67
76	26.93	35.06	22.81		0.66
103	17.38	34.81	25.29		1.64
127	13.20	34.93	26.32		2.12
155	12.26	34.91	26.49		2.30
186	11.82	34.86	26.53		2.32
217	11.48	34.83	26.57		2.37
253	11.16	34.79	26.60		2.35
288	10.88	34.79	26.65		2.41
325	10.19	34.71	26.71		2.37

STATION 9

M/V Hugh M. Smith: Cruise 15, 1°57'N, 140°03'W., May 31, 1952.
Messenger time: 1210 GCT. Weather: 02, cloud coverage 1.
Wind: 110°, 4 kt. Sea: 1-3 ft. Wire angle: 05°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.13	35.00	22.70		0.71
10	27.12	35.00	22.70		0.78
25	26.97	35.03	22.77		0.79
50	26.46	35.13	23.01		0.85
98 1/	16.55	34.81	25.49		1.76
146	12.98	34.86	26.31		2.07
192	12.46	34.91	26.45		2.40
240	11.48	34.87	26.60		2.47
289	11.00	34.84	26.67		2.47
338	10.35	34.77	26.73		2.55
387	09.79	34.76	26.82		2.69
430	09.12	34.70	26.89		2.79
438					
488	08.44	34.69	26.98		2.89

1/ Depth in question due to erratic unprotected thermometer.

STATION 10

M/V Hugh M. Smith: Cruise 15, 0°53'N, 140°02'W., May 31, 1952.
Messenger time: 2113 GCT. Weather: 02, cloud coverage 1.
Wind: 120°, 5 kt. Sea: 1-3 ft. Wire angle: 43°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	26.42	35.17	23.05		0.70
08	26.24	35.17	23.11		0.67
18	26.01	35.18	23.18		0.73
34	25.63	35.22	23.34		0.72
67	23.89	35.08	23.75		0.91
103	18.94	35.01	25.06		1.05
144	14.29	34.93	26.09		1.48
187	12.45	1/			1.82
233	11.88	34.86	26.52		1.98
279	11.56	34.87	26.59		2.21
326	10.78	34.83	26.70		2.34
375	09.68	34.78	26.85		2.29
423	08.94	34.70	26.91		2.55

1/ No sample.

STATION 11

M/V Hugh M. Smith: Cruise 15, 0°11'S, 139°52'W., June 1, 1952.
Messenger time: 0618 GCT. Weather: 25, cloud coverage 8.
Wind: 090°, 6 kt. Sea: 1-3 ft. Wire angle: 35°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	26.24	35.34	23.23		0.80
09	26.12	35.35	23.28		0.83
21	25.71	35.34	23.40		0.82
42	25.56	35.46	23.54		0.90
86	23.46	35.70	24.35		1.14
131	17.46	35.33	25.67		1.44
179	13.70	34.98	26.25		1.71
226	12.36	34.95	26.49		2.07
274	11.55	34.88	26.60		2.38
322	10.90	34.83	26.68		2.44
370	09.87	34.75	26.80		2.54
420	09.12	34.71	26.89		2.73
469	08.18	34.65	26.99		2.91

STATION 12

M/V Hugh M. Smith: Cruise 15, 1°02'S, 139°52'W., June 1, 1952. Messenger time: 1349 GCT. Weather: 63, cloud coverage not recorded. Wind: 090°, 20 kt. Sea: 3-5 ft. Wire angle: 48°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	26.40	35.53	23.33		0.71
08	26.60	35.52	23.26		0.77
18	26.58	35.52	23.26		0.76
34	26.39	35.53	23.33		0.72
67 1/	25.32	35.60	23.72		0.87
98	21.29	35.78	25.03		1.17
131	16.92	35.44	25.89		1.52
168	13.24	35.07	26.42		1.83
206	12.06	34.92	26.54		2.07
247 1/	11.84	34.90	26.56		2.12
292	11.34	34.88	26.64		2.12
338	10.58	34.83	26.74		2.27
386	09.75	34.78	26.84		2.32

1/ Depth in question due to erratic unprotected thermometer

STATION 13

M/V Hugh M. Smith: Cruise 15, 2°00'S, 139°50'W., June 1, 1952. Messenger time: 2128 GCT. Weather: 03, cloud coverage 2. Wind: 100°, 12 kt. Sea: 5-8 ft. Wire angle: 35°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.40	35.43	22.93		0.80
09	27.36	35.44 1/	22.95		0.82
20	27.28	35.43	22.97		0.83
40	27.26	35.43	22.98		0.83
80	21.28	35.62	24.91		1.31
119	14.08	35.07	26.24		2.40
159	12.53	34.96	26.47		2.48
200	12.26	2/			2.52
240	11.95	34.90	26.54		2.62
282	11.62	34.87	26.58		2.58
324	11.29	34.87	26.64		2.56
367	10.78	34.83	26.70		2.75
409	09.47	34.78	26.89		3.04

1/ Interpolated value.

2/ Sample lost.

STATION 14

M/V Hugh M. Smith: Cruise 15, 3°00'S, 139°52'W., June 2, 1952.
Messenger time: 0500 GCT. Weather: 03, cloud coverage 3.
Wind: 110°, 14 kt. Sea: 3-5 ft. Wire angle: 12°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.61	35.35	22.80		0.70
10	27.60	35.19	22.70		0.66
24	27.59	35.36	22.82		0.74
48	27.48	35.37	22.86		0.87
95 1/	18.45	35.49	25.55		1.35
142	13.10	34.96	26.36		2.27
188	12.57	34.94	26.45		2.20
234	12.40	34.93	26.47		2.35
281	12.04	34.94	26.55		2.57
328	11.04	34.86	26.68		2.57
376	10.10	34.79	26.79		2.77
424	09.15	34.73	26.90		2.85
473	08.16	34.67	27.01		2.86

1/ Depth in question due to erratic unprotected thermometer.

STATION 15

M/V Hugh M. Smith: Cruise 15, 4°00'S, 140°05'W., June 2, 1952.
Messenger time: first cast 1333 GCT, second cast 1350 GCT.
Weather: 02, cloud coverage 3. Wind: 090°, 14 kt. Sea: 3-5 ft.
Wire angle: first cast 38°, second cast 40°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.66	35.33	22.77		0.66
08	27.64	35.34	22.79		0.76
19	27.66	35.31	22.76		0.72
37	27.65	34.97	22.51		0.73
73	24.54	35.66	24.00		1.00
108	14.84	35.12	26.12		2.14
143	13.00	34.98	26.39		2.42
180	12.64	34.96	26.45		2.35
217	12.38	34.94	26.49		2.47
256	12.12	34.93	26.53		2.56
295	11.74	34.90	26.58		2.71
335	10.76	34.83	26.70		2.84
376	09.91	34.80	26.83		2.88

STATION 16

M/V Hugh M. Smith: Cruise 15, 5°30'S, 139°57'W., June 3, 1952.
Messenger time: 0504 GCT. Weather: 02, cloud coverage 3.
Wind: 100°, 8 kt. Sea: 1-3 ft. Wire angle: 30°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.93	34.94	22.39		0.61
08	27.93	34.95	22.40		0.62
22	27.91	34.92	22.38		0.60
39	27.87	34.92	22.40		0.61
73	26.71	35.60	23.28		0.73
99	25.21	35.78	23.88		0.78
123	19.52	35.91	25.60		1.00
150 1/	15.83	35.27	26.01		1.65
174	13.66	35.08	26.34		2.02
202	12.64	35.01	26.49		2.00
232	12.22	34.96	26.53		2.05
265	11.65	34.93	26.62		2.10
298 1/	10.44	34.84	26.77		2.36

1/ Depth in question due to erratic unprotected thermometer.

STATION 17

M/V Hugh M. Smith: Cruise 15, 7°00'S, 139°58'W., June 3, 1952.
Messenger time: 1545 GCT. Weather: 62, cloud coverage 7.
Wind: 180°, 2 kt. Sea: 1-3 ft. Wire angle: 18°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
01	28.04	35.05	22.44		0.77
10	28.01	35.05	22.45		0.72
24	28.02	35.05	22.45		0.67
47	28.02	35.04	22.44		0.72
94	27.17	35.90	23.36		0.82
138	22.04	36.15	25.10		0.84
182	17.28	35.36	25.74		1.28
226	13.42	35.02	26.34		2.28
269	11.26	34.83	26.61		2.21
313	10.33	34.80	26.76		2.29
357	09.48	34.71	26.83		2.37
402	08.71	34.70	26.95		2.36
448	07.95	34.64	27.02		2.50

STATION 18

M/V Hugh M. Smith: Cruise 15, 5°26'S, 140°00'W., June 4, 1952.
Messenger time: 0424 GCT. Weather: 02, cloud coverage 9.
Wind: 090°, 10 kt. Sea: 1-3 ft. Wire angle: 28°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	28.03	34.95	22.37		0.59
09	27.91	34.91	22.38		0.58
22	27.80	34.94	22.44		0.60
43	27.78	34.94	22.44		0.58
85	25.98	35.73	23.61		0.78
123	20.56	35.73	25.18		1.06
161	15.40	35.21	26.06		1.91
200	12.72	34.99	26.46		2.22
241	12.05	34.96	26.57		2.17
285	11.31	34.90	26.66		2.20
330	10.45	34.82	26.75		2.52
375	09.76	34.77	26.83		2.85
421	09.08	34.76	26.94		2.85

STATION 19

M/V Hugh M. Smith: Cruise 15, 3°52'S, 140°04'W., June 4, 1952.
Messenger time: first cast 1536 GCT, second cast 1553 GCT.
Weather: 03, cloud coverage 8. Wind: 160°, 8 kt. Sea: 1-3 ft.
Wire angle: first cast 13°, second cast 15°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.72	35.33	22.76		0.79
10	27.69	35.35	22.78		0.82
24	27.64	35.35	22.79		0.86
48	27.60	35.31	22.78		0.80
96	15.41	35.19	26.05		2.08
144	13.04	35.01	26.41		2.48
191	12.68	1/			2.36
239	12.43	34.96	26.49		2.67
286	12.12	34.93	26.53		2.75
333	11.60	34.91	26.61		2.83
381	10.61	34.84	26.74		2.94
431	09.30	34.74	26.89		3.11
482	08.66	34.73	26.98		3.14

1/ No sample.

STATION 20

M/V Hugh M. Smith: Cruise 15, 2°50'S., 140°06'W., June 4, 1952.
Messenger time: 2353 GCT. Weather: 03, cloud coverage 7.
Wind: 070°, 10 kt. Sea: 1-3 ft. Wire angle not recorded

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.93	35.36	22.71		0.64
10	27.64	35.36	22.80		0.62
25	27.58	35.35	22.81		0.67
49	27.55	35.37	22.84		0.64
96 1/	16.76	35.31	25.82		1.66
143	12.88	34.97	26.41		2.06
190	12.52	34.94	26.46		2.29
237	12.32	34.91	26.48		2.36
283	11.91	34.90	26.55		2.59
331	11.08	34.84	26.65		2.63
378	09.88	34.77	26.81		2.83
425	08.92	34.73	26.94		2.84
474	07.94	34.67	27.04		2.89

1/ Depth in question due to erratic unprotected thermometer

STATION 21

M/V Hugh M. Smith: Cruise 15, 1°46'S., 140°09'W., June 5, 1952.
Messenger time: 0720 GCT. Weather: 02, cloud coverage 3.
Wind: 040°, 13 kt. Sea: 1-3 ft. Wire angle: 21°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.19	35.48	23.04		0.87
10	27.19	35.52	23.07		0.83
23	27.10	35.48	23.07		0.83
47	26.92	35.43	23.13		0.86
92	17.02	35.31	25.76		1.86
137	12.97	34.97	26.39		2.47
181	12.60	34.95	26.45		2.76
225	12.17	34.92	26.51		2.64
271	11.76	34.90	26.57		2.61
318	11.04	34.86	26.68		2.57
364	10.00	34.82	26.83		2.86
411	08.86	34.72	26.94		3.01
459	08.12	34.70	27.04		2.95

STATION 22

M/V Hugh M. Smith: Cruise 15, 0°43'S, 140°11'W., June 5, 1952.
Messenger time: 1537 GCT. Weather: 03, cloud coverage 2.
Wind: 050°, 11 kt. Sea: 1-3 ft. Wire angle: 28°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	26.32	35.49	23.30		0.69
09	26.40	35.50	23.30		0.68
22	26.39	35.51	23.32		0.72
44	26.25	35.53	23.37		0.71
88	19.99	35.61	25.24		1.27
131	15.09	35.21	26.13		1.66
174	12.64	34.97	26.46		2.12
217	12.05	34.89	26.51		2.30
260	11.81	34.88	26.55		2.23
305	11.42	34.86	26.61		2.18
350	10.76	34.82	26.70		2.26
396	09.58	34.74	26.84		2.33
451	08.17	34.66	27.00		2.63

STATION 23

M/V Hugh M. Smith: Cruise 15, 0°00', 139°59'W., June 5, 1952.
Messenger time: 2207 GCT. Weather: 03, cloud coverage 3.
Wind: 070°, 11 kt. Sea: 3-5 ft. Wire angle: 35°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	26.20	35.46	23.34		0.70
08	26.18	35.48	23.36		0.84
20	26.00	35.45	23.39		0.95
41	25.74	35.57	23.56		1.03
83 1/	22.34	35.77	24.72		1.26
126	16.92	35.27	25.76		1.49
171	13.41	35.02	26.34		1.80
215	12.52	34.95	26.47		2.09
265	11.84	34.88	26.55		2.26
311	11.12	34.83	26.64		2.29
361	10.24	34.79	26.77		2.54
408	09.02	34.73	26.92		2.70
459	08.04	34.67	27.03		3.01

1/ Depth in question due to erratic unprotected thermometer

STATION 24

M/V Hugh M. Smith: Cruise 15, 1°02'N, 139°58'W., June 6, 1952.
Messenger time: 0733 GCT. Weather: 01, cloud coverage 5.
Wind: 090°, 14 kt. Sea: 3-5 ft. Wire angle: 30°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	25.90	35.18	23.22		0.69
09	25.90	35.17	23.21		0.65
22	25.70	35.18	23.28		0.68
44	25.41	35.16	23.36		0.74
88	18.86	34.90	25.00		1.07
133	14.10	34.94	26.14		1.44
179	12.81	34.92	26.39		1.69
225	12.06	34.90	26.52		1.94
271	11.57	34.86	26.58		2.24
319	10.86	34.85	26.70		2.34
367	09.77	34.74	26.81		2.39
416	09.28	34.72	26.87		2.50
466	08.45	34.68	26.97		2.63

STATION 25

M/V Hugh M. Smith: Cruise 15, 2°04'N, 139°57'W., June 6, 1952.
Messenger time: 1656 GCT. Weather: 03, cloud coverage 8.
Wind: 130°, 14 kt. Sea: 1-3 ft. Wire angle: 28°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	26.91	35.11	22.85		0.74
09	26.90	35.10	22.85		0.75
23	26.89	35.10	22.85		0.75
44	26.61	35.09	22.93		0.81
87	19.00	34.87	24.94		1.61
127	13.10	34.81	26.24		2.13
167	12.20	34.91	26.50		2.37
207	11.92	34.89	26.54		2.47
248	11.74	34.88	26.56		2.46
289	11.45	34.87	26.61		2.49
331	10.92	34.83	26.68		2.53
375	10.24	34.78	26.76		2.48
421	09.60	34.73	26.83		2.60

STATION 26

M/V Hugh M. Smith: Cruise 15, 3°06'N, 140°00'W., June 7, 1952.
Messenger time: 0159 GCT. Weather: 02, cloud coverage 9.
Wind: 130°, 9 kt. Sea: 1-3 ft. Wire angle: 23°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.67	34.94	22.48		0.59
09	27.65	34.88	22.44		0.59
22	27.45	34.90	22.52		0.57
44	26.90	35.11	22.85		0.65
86	25.99	35.14	23.16		0.75
128	14.42	34.86	26.01		1.90
170	12.72	34.94	26.42		2.15
214	12.14	34.88	26.49		2.35
257	11.63	34.87	26.57		2.36
301	10.98	34.81	26.65		2.38
346	10.44	34.77	26.72		2.30
391	09.99	34.71	26.75		2.25
437	09.51	34.71	26.83		2.38

STATION 27

M/V Hugh M. Smith: Cruise 15, 4°09'N, 140°06'W., June 7, 1952.
Messenger time: 1109 GCT. Weather: 02, cloud coverage 9.
Wind: 140°, 11 kt. Sea: 1-3 ft. Wire angle: 25°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	28.04	34.66	22.15		0.58
09	28.02	1/			0.61
23	28.02	34.70	22.18		0.58
45	27.82	34.81	22.33		0.62
87	25.87	34.96	23.06		0.85
129	16.20	34.76	25.54		1.73
171	11.46	34.64	26.43		2.17
214	10.47	34.74	26.69		2.35
257	10.12	34.78	26.78		2.51
301	09.92	34.77	26.81		2.45
345	09.51	34.72	26.83		2.41
390	09.30	34.71	26.86		2.46
436	08.90	34.69	26.91		2.69

1/ No sample.

STATION 28

M/V Hugh M. Smith: Cruise 15, 5°10'N, 140°12'W., June 7, 1952.
Messenger time: 2014 GCT. Weather: 01, cloud coverage 3.
Wind: 120°, 13 kt. Sea: 1-3 ft. Wire angle: 15°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.81	34.13	21.82		0.35
10	27.76	34.23	21.92		0.33
25	27.84	34.58	22.15		0.38
49	27.79	34.59	22.17		0.36
97	24.67	34.92	23.40		0.66
145	13.07	34.65	26.13		1.95
193	10.49	34.71	26.66		2.51
241	09.90	34.69	26.75		2.28
289	09.53	34.70	26.82		2.60
337	09.16	34.68	26.86		2.55
385	08.88	34.67	26.90		2.66
433	08.53	34.65	26.94		2.74
482	08.21	34.64	26.98		2.78

STATION 29

M/V Hugh M. Smith: Cruise 15, 6°07'N, 140°11'W., June 8, 1952.
Messenger time: 0340 GCT. Weather: 65, cloud coverage 10.
Wind: 120°, 12 kt. Sea: 1-3 ft. Wire angle: 04°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
02	28.05	34.46	22.00		0.57
12	27.88	34.48	22.07		0.60
27	27.80	34.56	22.15		0.52
52	27.66	34.61	22.24		0.58
101	17.45	34.71	25.20		1.31
150	11.80	34.68	26.40		2.57
199	10.42	34.70	26.66		2.73
247	09.81	34.69	26.76		2.65
295	09.40	34.66	26.81		2.68
344	09.05	34.66	26.86		2.73
394	08.77	34.64	26.89		2.81
443	08.32	34.62	26.95		2.88
493	08.01	34.61	26.99		2.96

STATION 30

M/V Hugh M. Smith: Cruise 15, 7°04'N, 140°10'W., June 8, 1952.
Messenger time: 1224 GCT. Weather: 51, cloud coverage 8.
Wind: 060°, 10 kt. Sea: 1-3 ft. Wire angle: 03°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
02	27.34	34.50	22.25		0.37
12	27.36	34.52	22.26		0.36
27	27.26	34.64	22.39		0.38
51	27.11	34.72	22.50		0.39
100	12.34	34.71	26.32		2.60
148	10.96	34.71	26.59		2.57
196	10.25	34.71	26.70		2.58
244	09.64	34.69	26.79		2.59
293	09.22	34.68	26.85		2.70
341	08.86	34.64	26.88		2.71
389	08.45	34.63	26.93		2.80
439	08.06	34.61	26.98		2.84
490	07.62	34.59	27.03		2.86

STATION 31

M/V Hugh M. Smith: Cruise 15, 8°00'N, 140°00'W., June 8, 1952.
Messenger time: 1941 GCT. Weather: 02, cloud coverage 4.
Wind: 090°, 12 kt. Sea: 3-5 ft. Wire angle: 15°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
01	27.15	34.53	22.34		0.63
11	26.96	34.53	22.40		0.59
24	26.83	34.52	22.42		0.62
48	14.67	34.53	25.70		2.72
97	11.94	34.78	26.45		2.98
144	11.14	34.74	26.57		3.08
191	10.53	34.73	26.67		2.94
237	10.04	34.71	26.74		2.93
285	09.70	34.69	26.78		3.00
333	09.37	34.69	26.84		3.22
381	08.90	34.64	26.87		3.39
430	08.48	34.61	26.91		3.38
480	07.97	34.60	26.99		3.45

STATION 32

M/V Hugh M. Smith: Cruise 15, 7°04'N, 140°04'W., June 9, 1952.
Messenger time: 0357 GCT. Weather: 03, cloud coverage 6.
Wind: 090°, 11 kt. Sea: 5-8 ft. Wire angle: 15°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.65	34.55	22.19		0.35
10	27.59	34.56	22.22		0.34
24	27.24	34.71	22.44		0.39
48	26.74	34.90	22.75		0.53
96	12.46	34.69	26.28		2.68
191	10.06	34.69	26.72		2.53
239	09.56	34.69	26.80		2.64
287	09.18	34.66	26.84		2.65
336	08.86	34.65	26.90		2.72
382	08.57	34.64	26.92		2.72
430	08.10	34.62	26.98		2.81
479	07.70	34.61	27.03		2.90

150 meter bottle pretripped.

STATION 33

M/V Hugh M. Smith: Cruise 15, 6°05'N, 139°58'W., June 9, 1952.
Messenger time: 1421 GCT. Weather: 01, cloud coverage 6.
Wind: 200° (variable), 4 kt. Sea: 1-3 ft. Wire angle: 28°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.83	34.39	22.01		0.55
09	27.85	34.46	22.06		0.55
22	27.84	34.47	22.07		0.59
42	27.84	34.47	22.07		0.61
81	24.61	34.36	23.37		0.79
117	14.10	34.59	25.87		1.92
155	11.20	34.71	26.53		2.59
192	10.37	34.70	26.67		2.74
231	09.92	34.70	26.75		2.68
271	09.52	34.68	26.80		2.68
312[1]/	09.24	34.69	26.81		2.73
355	08.92	34.65	26.88		2.84
400	08.68	34.61	26.88		2.88

1/ Depth in question due to erratic unprotected thermometer.

STATION 34

M/V Hugh M. Smith: Cruise 15, 5°00'N, 139°51'W., June 10, 1952.
Messenger time: 0101 GCT. Weather: 02, cloud coverage 7.
Wind: 180°, 7 kt. Sea: 1-3 ft. Wire angle: 22°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	28.25	34.51	21.93		0.41
10	28.14	34.52	22.01		0.39
23	28.05	34.52	22.04		0.42
47	27.72	34.79	22.35		0.57
93	25.25	34.96	23.25		0.77
139	14.24	34.68	25.78		1.74
184	11.44	34.63	26.43		2.25
229	10.10	34.67	26.70		2.39
274	09.78	34.70	26.77		2.26
319	09.43	34.69	26.83		2.38
365	09.06	34.64	26.85		2.71
410	08.68	34.65	26.92		2.70
456	08.32	34.62	26.95		2.74

STATION 35

M/V Hugh M. Smith: Cruise 15, 4°01'N, 139°55'W., June 10, 1952.
Messenger time: 1004 GCT. Weather: 02, cloud coverage 1.
Wind: 110°, 9 kt. Sea: 1-3 ft. Wire angle: 38°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.42	34.83	22.48		0.68
08	27.42	34.81	22.46		0.61
19	27.14	34.95	22.66		0.65
37	27.02	35.00	22.74		0.70
70	27.04	35.01	22.73		0.75
102 1/	27.18	34.99	22.67		0.73
137	13.00	34.93	26.35		2.29
173	12.28	34.92	26.49		2.40
211	11.54	34.85	26.57		2.25
250	11.67	34.81	26.52		2.28
288	10.58	34.77	26.69		2.33
328	10.09	34.75	26.76		2.59
368	09.79	34.71	26.78		2.42

1/ Suspected pretrip.

STATION 36

M/V Hugh M. Smith: Cruise 15, 3°00'N, 139°57'W., June 10, 1952.
Messenger time: 1825 GCT. Weather: 02, cloud coverage 3.
Wind: 140°, 8 kt. Sea: 1-3 ft. Wire angle: 47°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	26.98	34.87	22.65		0.56
06	26.92	34.91	22.70		0.55
16	26.86	34.94	22.74		0.61
32	26.50	35.02	22.91		0.62
58	26.47	35.00	22.91		0.64
80	23.69	34.95	23.72		0.90
97	16.06	34.87	25.65		1.80
118	14.03	34.94	26.15		2.00
139	13.14	34.93	26.33		2.04
161	12.70	34.95	26.42		2.14
184	12.57	34.94	26.45		2.14
210	12.19	34.88	26.48		2.21
235	11.83	34.88	26.55		2.29

STATION 37

M/V Hugh M. Smith: Cruise 15, 2°00'N, 139°56'W., June 11, 1952.
Messenger time: 0254 GCT. Weather: 03, cloud coverage 7.
Wind: 120°, 10 kt. Sea: 3-5 ft. Wire angle: 32°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.05	34.97	22.70		0.73
08	26.88	35.00	22.78		0.73
21	26.72	35.05	22.87		0.73
42	26.28	35.05	23.00		0.78
81	22.64	34.90	23.98		1.21
120	13.80	34.75	26.05		1.99
157	12.47	34.87	26.41		2.32
196	12.10	34.87	26.49		2.54
235	11.77	34.86	26.54		2.48
275	11.44	34.85	26.59		2.57
315	10.84	34.78	26.65		2.62
357	10.35	34.78	26.74		2.67
400	09.76	34.70	26.78		2.70

STATION 38

M/V Hugh M. Smith: Cruise 15, 0°58'N, 139°56'W., June 11, 1952.
Messenger time: 1132 GCT. Weather: 03, cloud coverage 2.
Wind: 100°, 11 kt. Sea: 3-5 ft. Wire angle: 36°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	26.48	35.12	22.99		0.66
08	26.46	35.13	23.01		0.64
20	26.44	35.10	22.99		0.63
39	26.36	35.09	23.01		0.61
78	20.45	34.90	24.56		1.04
159	11.95	34.80	26.46		1.88
199	11.74	34.87	26.55		2.04
243	11.52	34.85	26.58		2.21
331	10.33	34.74	26.71		2.25
377	09.89	34.71	26.76		2.31
424	08.41	34.66	26.96		2.74

120 and 300 meter bottles pretripped.

STATION 39

M/V Hugh M. Smith: Cruise 15, 0°04'S, 139°54'W., June 11, 1952.
Messenger time: 2029 GCT. Weather: 01, cloud coverage 1.
Wind: 110°, 13 kt. Sea: 3-5 ft. Wire angle: 33°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	25.92	35.15	23.19		0.80
09	25.84	35.15	23.22		0.74
21	25.64	35.15	23.28		0.76
44	24.90	35.27	23.60		0.85
88	19.84	35.29	25.04		1.21
134	14.10	34.97	26.16		1.56
181	12.46	34.93	26.46		1.92
229	12.05	34.88	26.50		2.09
277	11.70	34.86	26.55		2.37
373	09.82	34.73	26.79		2.67
422	08.95	34.70	26.91		2.86
471	08.16	34.63	26.98		3.00

300 meter bottle pretripped.

STATION 40

M/V Hugh M. Smith: Cruise 15, 1°06'S, 139°51'W., June 12, 1952.
Messenger time: 0614 GCT. Weather: 02, cloud coverage 5.
Wind: 130°, 12 kt. Sea: 3-5 ft. Wire angle: 18°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	26.08	35.46	23.38		0.75
09	26.06	35.45	23.38		0.73
23	25.90	35.47	23.44		0.76
47	25.81	35.51	23.50		0.75
95	20.20	35.71	25.27		1.21
190	12.98	35.02	26.43		1.99
238	11.92	34.90	26.54		2.13
285	11.72	34.88	26.57		2.26
333	11.28	34.86	26.63		2.27
381	09.78	34.77	26.83		2.40
430	08.51	34.66	26.95		2.60
479	07.88	34.63	27.02		2.74

150 meter bottle pretripped.

STATION 41

M/V Hugh M. Smith: Cruise 15, 2°08'S, 139°50'W., June 12, 1952.
Messenger time: 1459 GCT. Weather: 02, cloud coverage 8.
Wind: 140°, 9 kt. Sea: 3-5 ft. Wire angle: 07°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
02	26.59	35.46	23.22		0.72
12	26.57	35.44	23.21		0.72
26	26.56	35.44	23.21		0.72
50	26.53	35.46	23.24		0.74
98	17.30	35.25	25.65		1.75
146	13.09	34.92	26.33		2.39
194	12.67	34.90	26.40		2.31
241	12.31	34.88	26.45		2.46
289	11.78	34.87	26.55		2.63
337	10.89	34.82	26.67		2.77
384	09.68	34.73	26.81		2.79
432	08.66	34.65	26.92		2.74
480	07.97	34.64	27.02		2.89

STATION 42

M/V Hugh M. Smith: Cruise 15, 3°13'S., 139°49'W., June 12, 1952.
Messenger time: 2205 GCT. Weather: 03, cloud coverage 3.
Wind: 130°, 9 kt. Sea: 5-8 ft. Wire angle: 04°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
02	27.32	35.41	22.94		0.70
12	27.28	35.42	22.97		0.71
27	27.19	35.43	23.00		0.69
52	27.19	35.43	23.00		0.69
100	17.64	35.35	25.64		1.43
149	13.10	34.96	26.36		2.07
198	12.64	34.90	26.40		2.17
247	12.32	34.88	26.45		2.34
296	11.96	34.87	26.52		2.56
344	11.34	34.83	26.60		2.68
393	10.18	34.74	26.74		2.75
442	09.10	34.70	26.89		2.73
492	08.12	34.63	26.98		2.78

STATION 43

M/V Hugh M. Smith: Cruise 15, 4°05'S., 139°49'W., June 13, 1952.
Messenger time: 0529 GCT. Weather: 02, cloud coverage 4.
Wind: 110°, 11 kt. Sea: 5-8 ft. Wire angle: 16°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.40	35.42	22.93		0.70
10	27.38	35.43	22.94		0.72
24	27.30	35.44	22.97		0.71
48	27.30	35.43	22.97		0.73
95	23.90	35.62	24.16		1.13
142	13.57	34.99	26.29		2.36
189	12.56	34.90	26.42		2.43
234	12.22	34.87	26.46		2.58
280	11.78	34.84	26.52		2.73
327	11.21	34.82	26.61		2.59
374	09.98	34.73	26.76		2.81
420	09.12	34.68	26.87		2.92
469	08.52	34.65	27.21		2.81

STATION 44

M/V Hugh M. Smith: Cruise 15, 5°32'S., 139°54'W., June 13, 1952.
Messenger time: first cast 1803 GCT, second cast 1815 GCT.
Weather: 01, cloud coverage 6. Wind: 130°, 18 kt. Sea: 5-8 ft.
Wire angle: first cast 25°, second cast 28°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.54	35.09	22.63		0.67
08	27.54	35.10	22.64		0.65
22	27.52	35.11	22.65		0.63
44	27.52	35.14	22.68		0.64
88	25.82	35.70	23.64		0.76
134	19.81	35.64	25.32		1.05
178	13.87	35.00	26.23		2.11
223	12.08	34.88	26.50		2.60
267	11.34	34.84	26.60		2.57
312	10.74	34.79	26.68		2.62
357	09.98	34.73	26.76		2.75
402	09.34	34.69	26.84		2.80
447	08.83	34.64	26.88		2.86

STATION 45

M/V Hugh M. Smith: Cruise 15, 7°00'S., 140°00'W., June 14, 1952.
Messenger time: 0657 GCT. Weather: 64, cloud coverage 10.
Wind: 120°, 18 kt. Sea: 5-8 ft. Wire angle: 26°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.71	34.95	22.47		0.70
09	27.70	34.97	22.49		0.68
22	27.68	34.96	22.49		0.70
43	27.71	34.96	22.48		0.71
86	27.36	35.87	23.28		0.76
127	24.36	36.20	24.46		0.81
169	20.33	35.74	25.25		1.05
210	16.91	35.22	25.72		1.42
251	12.74	34.78	26.29		2.12
292	11.10	34.77	26.60		2.51
335	09.86	34.73	26.73		2.48
375	09.09	34.63	26.87		2.62
417	08.55	34.66	26.94		2.61

STATION 46

M/V Hugh M. Smith: Cruise 15, 5°29'S., 140°05'W., June 15, 1952. Messenger time: first cast 0010 GCT, second cast 0047 GCT. Weather: 01, cloud coverage 2. Wind: 080°, 13 kt. Sea: 5-8 ft. Wire angle: first cast 39°, second cast 48°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.61	35.26	22.74		0.71
08	27.60	35.26	22.74		0.71
20	27.52	35.25	22.76		0.70
37	27.50	35.27	22.78		0.70
71	27.30	35.35	22.91		0.69
103	24.00	35.88	24.33		0.89
137	19.18	35.57	25.43		1.10
171	14.86	35.12	26.11		1.95
207	13.42	35.00	26.33		2.15
236[1/]	12.46	34.93	26.46		2.50
283	11.44	34.84	26.59		2.48
323	10.89	34.82	26.67		2.44
364	09.92	34.75	26.79		2.65

1/ Bottle pretripped and was sent down again as a second cast.

STATION 47

M/V Hugh M. Smith: Cruise 15, 3°43'S., 140°04'W., June 15, 1952. Messenger time: 1621 GCT. Weather: 01, cloud coverage 6. Wind: 080°, 11 kt. Sea: 3-5 ft. Wire angle: 23°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.29	35.39	22.94		0.71
09	27.26	35.38	22.94		0.71
23	27.25	35.38	22.94		0.69
45	27.24	35.37	22.94		0.70
90	22.08	35.43	24.54		1.30
133	13.37	34.95	26.30		2.33
175	12.78	34.90	26.38		2.37
218	12.44	34.87	26.42		2.39
260	12.15	34.87	26.48		2.35
302	11.82	34.88	26.55		2.68
346	11.30	34.81	26.59		2.77
389	10.31	34.77	26.74		2.82
433	09.24	34.67	26.84		2.94

STATION 48

M/V Hugh M. Smith: Cruise 15, 3°00'S., 140°00'W., June 15, 1952.
Messenger time: 2340 GCT. Weather: 02, cloud coverage 1.
Wind: 120°, 11 kt. Sea: 3-5 ft. Wire angle: 27°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.14	35.47	23.05		0.73
09	27.04	35.46	23.07		0.73
22	26.90	35.45	23.11		0.72
44	26.88	35.46	23.12		0.72
87	22.16	35.44	24.52		1.23
129	13.86	34.99	26.23		2.19
171	12.86	34.89	26.35		2.35
213	12.53	34.88	26.41		2.40
256	12.14	34.86	26.47		2.48
298	11.69	34.82	26.53		2.50
341	10.85	34.78	26.65		2.75
384	10.25	34.75	26.73		2.74
428	09.03	34.66	26.87		2.77

STATION 49

M/V Hugh M. Smith: Cruise 15, 2°00'S., 139°53'W., June 16, 1952.
Messenger time: 0914 GCT. Weather: 02, cloud coverage 1.
Wind: 100°, 12 kt. Sea: 3-5 ft. Wire angle: 20°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	26.57	35.53	23.27		0.81
09	26.57	35.55	23.29		0.79
23	26.54	35.55	23.30		0.78
46	26.46	35.54	23.32		0.76
92	22.12	35.63	24.68		1.16
136	13.90	35.05	26.26		2.21
181	12.71	34.96	26.44		2.20
226	12.28	34.93	26.50		2.32
272	11.90	34.91	26.56		2.35
319	11.48	34.87	26.60		2.35
366	11.04	34.84	26.66		2.25
413	09.72	34.78	26.85		2.71
463	08.26	34.66	26.99		2.73

STATION 50

M/V Hugh M. Smith: Cruise 15, 0°57'S, 139°47'W., June 16, 1952.
Messenger time: 1834 GCT. Weather: 02, cloud coverage 1.
Wind: 090°, 11 kt. Sea: 3-5 ft. Wire angle: 25°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	25.94	35.45	23.41		0.76
09	25.90	35.43	23.41		0.76
23	25.82	35.44	23.44		0.78
45	25.63	35.47	23.52		0.79
91	21.36	35.77	25.00		1.16
186	13.07	34.96	26.37		1.72
233	12.06	34.91	26.53		2.05
281	11.68	34.87	26.57		2.33
330	10.20	34.77	26.76		2.35
378	09.15	34.69	26.87		2.57
427	08.46	34.67	26.96		2.69
476	07.72	34.62	27.04		2.87

150 meter bottle pretripped.

STATION 51

M/V Hugh M. Smith: Cruise 15, 0°01'S, 139°43'W., June 17, 1952.
Messenger time: 0119 GCT. Weather: 03, cloud coverage 2.
Wind: 100°, 9 kt. Sea: 3-5 ft. Wire angle: 46°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	25.94	35.26	23.27		0.78
06	25.87	35.26	23.29		0.76
17	25.44	35.25	23.41		0.76
34	25.08	35.28	23.55		0.77
72	21.34	35.24	24.60		1.08
153	13.88	34.92	26.17		1.53
198	12.40	34.88	26.44		1.84
244	11.98	34.85	26.50		2.04
290	11.46	34.81	26.56		2.35
337	10.40	34.73	26.69		2.34
385	09.76	34.71	26.79		2.51
435	08.88	34.65	26.88		2.64

120 meter bottle pretripped.

STATION 52

M/V Hugh M. Smith: Cruise 15, 1°00'N, 139°51'W., June 17, 1952.
Messenger time: 1013 GCT. Weather: 02, cloud coverage 2.
Wind: 100°, 11 kt. Sea: 3-5 ft. Wire angle: 17°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	25.80	35.08	23.18		0.75
10	25.81	35.03	23.14		0.75
24	25.66	35.05	23.18		0.75
48	24.22	34.97	23.57		0.95
96	17.63	34.79	25.22		1.32
190	11.72	34.85	26.54		2.07
236	11.62	34.86	26.57		2.25
283	11.26	34.81	26.60		2.33
331	10.82	34.83	26.69		2.35
377	09.70	34.69	26.78		2.36
426	08.56	34.67	26.95		2.68
474	07.99	34.63	27.01		2.78

150 meter bottle pretripped.

STATION 53

M/V Hugh M. Smith: Cruise 15, 2°06'N, 140°02'W., June 17, 1952.
Messenger time: 1951 GCT. Weather: 02, cloud coverage 2.
Wind: 110°, 11 kt. Sea: 3-5 ft. Wire angle: 43°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	26.69	34.95	22.80		0.66
08	26.65	34.96	22.82		0.66
19	26.57	34.93	22.82		0.66
35	26.42	34.96	22.89		0.73
68	25.70	35.10	23.22		0.74
94	22.28	34.90	24.08		1.16
121	13.54	34.96	26.27		2.26
148	12.88	34.92	26.37		2.30
175	12.49	34.88	26.42		2.31
203	12.18	34.87	26.47		2.44
230	11.84	34.85	26.52		2.50
262	11.50	34.82	26.56		2.46
299	11.12	34.79	26.61		2.52

STATION 54

M/V Hugh M. Smith: Cruise 15, 3°11'N, 140°13'W., June 18, 1952.
Messenger time: 0420 GCT. Weather: 03, cloud coverage 2.
Wind: 140°, 13 kt. Sea: 3-5 ft. Wire angle: 43°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.92	34.67	22.19		0.48
08	27.94	34.67	22.19		0.48
21	27.90	34.67	22.20		0.48
36	27.83	34.68	22.23		0.52
69	27.41	34.82	22.48		0.58
100	25.62	34.93	23.12		0.81
127	13.86	34.95	26.19		2.13
155	13.07	34.94	26.35		2.15
185	12.74	34.92	26.40		2.18
216	12.35	34.89	26.45		2.26
249	12.04	34.87	26.50		2.33
283	11.58	34.83	26.55		2.36
320	11.00	34.79	26.63		2.35

STATION 55

M/V Hugh M. Smith: Cruise 15, 4°00'N, 140°09'W., June 18, 1952.
Messenger time: 1156 GCT. Weather: 02, cloud coverage 1.
Wind: 120°, 12 kt. Sea: 3-5 ft. Wire angle: 30°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.92	34.63	22.16		0.52
09	27.94	34.64	22.17		0.52
21	27.92	34.62	22.16		0.52
41	27.92	34.64	22.17		0.53
65 1/	27.89	34.70	22.23		0.66
79	27.28	34.84	22.53		0.69
158	12.99	34.91	26.34		2.21
197	12.14	34.88	26.49		2.43
240	11.60	34.83	26.55		2.46
283	10.96	34.79	26.64		2.44
327	10.39	34.77	26.73		2.47
372	10.02	34.73	26.76		2.39
419	09.50	34.71	26.83		2.47

1/ Suspected pretrip.

STATION 56

M/V Hugh M. Smith: Cruise 15, 5°00'N, 140°04'W., June 18, 1952.
Messenger time: 1922 GCT. Weather: 02, cloud coverage 6.
Wind: 130°, 10 kt. Sea: 3-5 ft. Wire angle: 04°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
02	27.98	34.65	22.16		0.49
12	27.84	34.66	22.21		0.51
27	27.82	34.64	22.20		0.45
52	27.82	34.64	22.20		0.46
101	27.50	34.92	22.52		0.64
197	10.92	34.71	26.58		2.09
245	10.43	34.73	26.69		2.44
293	10.00	34.73	26.76		2.44
342	09.62	34.70	26.80		2.50
390	09.28	34.66	26.83		2.52
439	08.94	34.61	26.84		2.53
487	08.62	34.65	26.92		2.68

150 meter bottle pretripped.

STATION 57

M/V Hugh M. Smith: Cruise 15, 5°54'N, 140°00'W., June 19, 1952.
Messenger time: 0242 GCT. Weather: 02, cloud coverage 9.
Wind: 010°, 4 kt. Sea: 3-5 ft. Wire angle: 12°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	28.17	34.39	21.90		0.46
10	27.96	34.42	21.99		0.48
24	27.98	34.73	22.22		0.55
48	27.93	34.78	22.27		0.66
95	25.98	34.91	22.99		0.78
141 1/	19.20	34.71	24.76		1.44
186	10.94	34.70	26.57		2.68
230	10.12	34.69	26.71		2.69
275	09.62	34.69	26.79		2.62
321	09.28	34.67	26.83		2.79
367	08.90	34.66	26.89		2.83
415	08.57	34.65	26.93		2.80
465	08.17	34.61	26.96		2.96

1/ Temperature value not in agreement with the BT, omitted from T-S curve.

STATION 58

M/V Hugh M. Smith: Cruise 15, 6°47'N, 139°56'W., June 19, 1952.
Messenger time: 1250 GCT. Weather: 02, cloud coverage 2.
Wind: 040°, 19 kt. Sea: 5-8 ft. Wire angle: 12°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
00	27.77	34.70	22.27		0.44
10	27.75	34.66	22.24		0.46
25	27.75	34.70	22.27		0.44
49	27.56	34.73	22.36		0.45
97	13.60	34.61	25.99		1.88
145	11.28	34.72	26.52		2.51
192	10.12	34.72	26.73		2.48
240	09.70	34.76	26.83		2.63
288	09.38	34.70	26.84		2.63
336	09.09	34.69	26.88		2.64
384	08.84	34.68	26.91		2.72
432	08.44	34.66	26.96		2.73
482	08.10	34.64	27.00		2.81

STATION 59

M/V Hugh M. Smith: Cruise 15, 8°00'N, 139°52'W., June 19, 1952.
Messenger time: 2316 GCT. Weather: 02, cloud coverage 2.
Wind: 040°, 11 kt. Sea: 5-8 ft. Wire angle: 03°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
02	27.29	34.40	22.20		0.50
12	27.18	34.43	22.25		0.54
27	27.10	34.83	22.58		0.56
52	13.84	34.52	25.87		2.36
101	11.92	34.79	26.46		2.88
150	10.92	34.71	26.58		2.83
198	10.15	34.68	26.70		2.80
246	09.70	34.69	26.78		2.85
294	09.36	34.63	26.79		2.88
342	08.98	34.64	26.86		2.94
391	08.58	34.62	26.91		3.05
439	08.18	34.60	26.95		3.12
488	07.74	34.59	27.01		3.24

STATION 60

M/V Hugh M. Smith: Cruise 15, 9°00'N, 140°00'W., June 20, 1952.
Messenger time: 0741 GCT. Weather: 02, cloud coverage 3.
Wind: 040°, 13 kt. Sea: 5-8 ft. Wire angle: 02°

OBSERVED

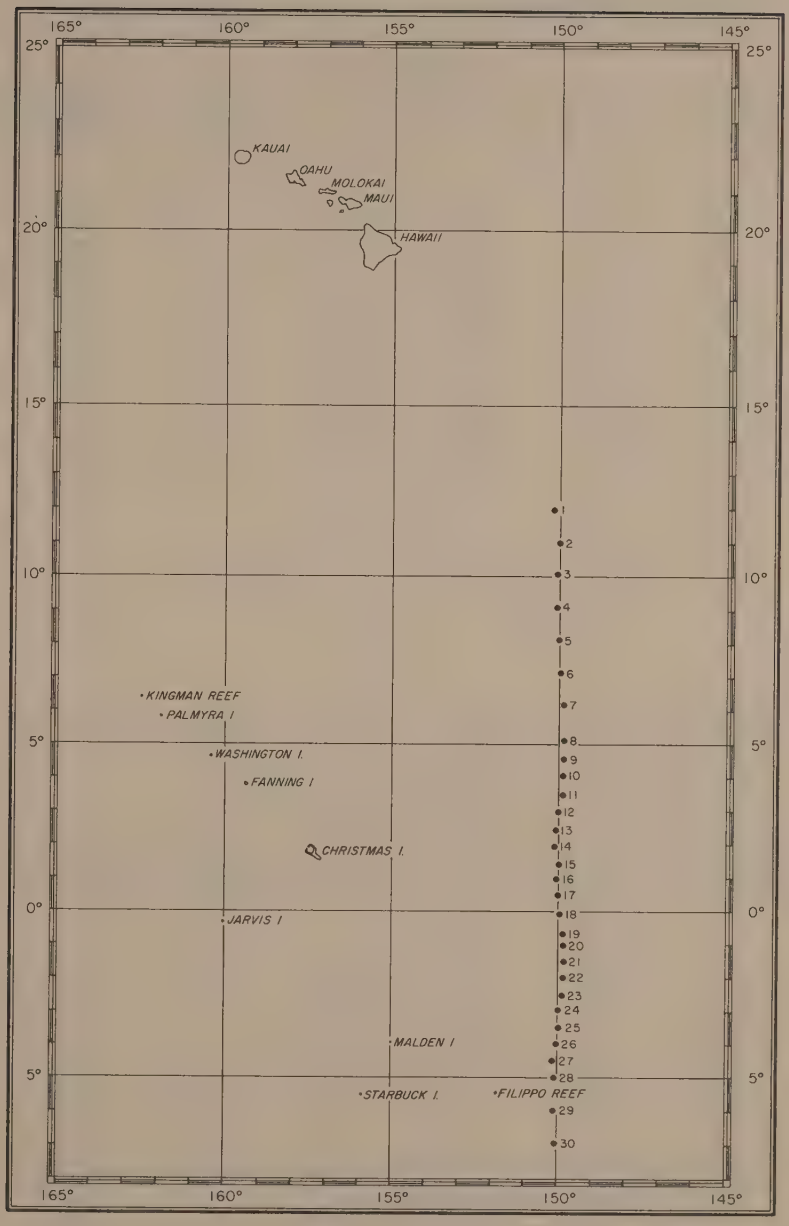
DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
02	27.09	34.45	22.30		0.35
12	27.08	34.47	22.32		0.35
27	27.04	34.46	22.32		0.35
51	13.72	34.65	25.99		2.56
99	11.67	34.77	26.49		2.57
147	10.94	34.73	26.59		2.55
195	10.44	34.72	26.68		2.59
243	10.12	34.70	26.72		2.67
292	09.75	34.67	26.74		2.75
340	09.32	34.67	26.83		2.86
388	08.82	34.61	26.86		2.91
438	08.31	34.61	26.94		3.01
488	07.90	34.57	26.97		3.10

Notes on the tabulated data, Hugh M. Smith cruise 16

1. All stations of this cruise consisted of shallow casts, with the bottle spacing varied to give maximum detail in the region of the thermocline. Any variation from a 13-bottle cast has been explained in a footnote.

2. On all stations, when the corrected readings of the duplicate protected thermometers differed by more than 0.1° above 300 M, or 0.05° below 300 M, the depth of observation is repeated and both temperatures are carried. Sigma-t values calculated using each temperature are tabulated. Similarly, when the duplicate determinations of inorganic phosphate for any depth differed by more than 0.01 extinction (approximately 0.04 µg at/l), the depth of observation is repeated, and both values are carried. However, when one of either of the above duplicates was known definitely to be in error, it was dropped from the tabulations.

3. Weather is recorded according to the ww (present weather) code in the U. S. Weather Bureau Circular M, 8th edition, Manual of Marine Meteorological Observations. Wind velocity was measured with an anemometer 30 M above the sea surface; speed is recorded in knots, and direction is given in degrees true from which the wind was blowing.



Appendix A, Fig. 1. -- Station positions for Hugh M. Smith cruise 16, July 23 to August 29, 1952.

STATION 1

M/V Hugh M. Smith: Cruise 16, 11°56'N, 150°09'W., July 27, 1952. Messenger time: 1425 GCT. Weather: 02, cloud coverage not recorded. Wind: 060°, 22 kt. Sea: 3-5 ft. Wire angle: 41°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	26.12	34.64	22.75		0.29
37	25.96	34.71	22.85		0.32
55	25.37	34.69	23.02		0.36
73	24.06	34.64	23.37		0.35
91	22.20	34.95	24.14		0.34
108	20.02	34.78	24.61		0.45
127	15.95	34.43	25.34		1.14
127					1.18
144	13.56	34.51	25.92		2.40
161	12.63	34.63	26.20		2.68
179	12.06	34.74	26.40		2.68
216	11.45	34.76	26.52		2.60
255	11.04	34.70	26.55		2.62
255					2.67
295	10.70	34.73	26.64		2.64
295 1/	10.62	34.73	26.65		2.56

1/ Both the temperature and phosphate determinations were out of tolerance for this depth.

STATION 2

M/V Hugh M. Smith: Cruise 16, 11°00'N, 150°00'W., July 27, 1952. Messenger time: 2306 GCT. Weather: 81, cloud coverage 10. Wind: 070°, 23 kt. Sea: 5-8 ft. Wire angle: 30°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
05	27.29	1/			0.39
44	25.72	34.77	22.97		0.41
66	25.17	34.70	23.09		0.36
87	22.34	34.89	24.06		0.36
109	19.62	34.79	24.72		0.59
131	16.18	34.45	25.30		1.20
153	13.34	34.52	25.97		2.34
175	12.63	1/			2.64
198	11.94	34.73	26.41		2.68
220	11.44	1/			2.31
220					2.40 2/
264	10.87	34.76	26.63		2.66
310	10.36	34.70	26.67		2.67
356	09.92	34.71	26.76		2.66
356	09.86	34.71	26.77		2.61

1/ No samples.

2/ Both values appear anomalous.

STATION 3

M/V Hugh M. Smith: Cruise 16, 10°01'N, 150°03'W., July 28, 1952. Messenger time: 0807 GCT. Weather: 02, cloud coverage not recorded. Wind: 070°, 10 kt. Sea: 3-5 ft. Wire angle: 30°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	27.37	34.25	22.05		0.42
41	25.64	34.70	22.94		0.43
62	24.58	34.63	23.21		0.38
82	21.54	34.89	24.28		0.43
103	17.67	34.54	25.02		1.03
123	14.02	34.39	25.72		2.07
143	13.01	34.65	26.14		2.63
164	12.31	34.71	26.32		2.80
184	11.66	34.70	26.44		2.71
184					2.80
204	11.34	34.70	26.50		2.77
204					2.84
245	10.82	34.70	26.59		2.81
288	10.30	34.68	26.67		2.81
332	09.82	34.67	26.74		2.88
332					2.83

STATION 4

M/V Hugh M. Smith: Cruise 16, 9°05'N, 150°06'W., July 28, 1952. Messenger time: 1653 GCT. Weather: 02, cloud coverage 7. Wind: 160°, 16 kt. Sea: 3-5 ft. Wire angle: 16°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
05	27.74	34.42	22.06		0.37
47	25.85	34.66	22.84		0.37
71	21.80	34.60	23.99		0.43
94	15.96	34.38	25.30		1.08
94					1.02
117	12.98	34.49	26.02		2.44
140	12.00	34.60	26.30		2.66
163	11.46	34.69	26.47		2.56
184	11.11	34.74	26.57		2.66
207	10.72	34.72	26.63		2.66
229	10.40	34.70	26.67		2.66
275	09.82	34.66	26.74		2.69
321	09.38	34.62	26.78		2.83
321					2.73
368 1/	09.36	34.60	26.76		2.73
368	09.49	34.60	26.74		

1/ Suspected pretrip.

STATION 5

M/V Hugh M. Smith: Cruise 16, 8°06'N, 150°02'W., July 29, 1952. Messenger time: 0135 GCT. Weather: 02, cloud coverage 5. Wind: 080°, 18 kt. Sea: 5-8 ft. Wire angle: 01°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
05	28.19	34.48	21.96		0.41
45	27.72	34.68	22.27		0.39
65	24.77	34.68	23.19		0.50
85	16.76	34.44	25.16		1.24
104	12.82	34.46	26.03		2.35
104					2.31
124	12.15	34.71	26.35		2.74
148	11.57	34.77	26.51		2.68
148					2.60
172	11.14	34.76	26.58		2.72
196	10.76	34.76	26.65		2.69
196					2.59
243	10.24	34.74	26.73		2.69
291	09.78	34.74	26.80		2.75
340	09.42	34.70	26.83		2.73
340					2.78
389	08.96	34.68	26.89		2.79

STATION 6

M/V Hugh M. Smith: Cruise 16, 7°08'N, 149°58'W., July 29, 1952. Messenger time: 1052 GCT. Weather: 81, cloud coverage not recorded. Wind: 090°, 17 kt. Sea: 3-5 ft. Wire angle: 00°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
05	28.16	34.86	22.26		0.48
45	28.20	34.91	22.28		0.49
65	28.20	34.91	22.28		0.46
84	28.08	34.89	22.31		0.51
84					0.46
104	23.15	34.74	23.72		0.81
123	17.70	34.54	25.01		1.12
147	13.06	34.47	25.99		2.22
172	11.52	34.65	26.42		2.65
196	10.86	34.70	26.58		2.63
244	10.08	34.70	26.72		2.72
244					2.67
291	09.58	34.70	26.81		2.65
340	09.09	34.66	26.86		2.69
340					2.63
388	08.72	34.63	26.89		2.77
388					2.71

STATION 7

M/V Hugh M. Smith: Cruise 16, 6°10'N, 149°49'W., July 29, 1952.
Messenger time: 1943 GCT. Weather: 02, cloud coverage 10.
Wind: 130°, 20 kt. Sea: 5-8 ft. Wire angle: 30°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	27.94	34.95	22.40		0.50
59	27.80	35.00	22.48		0.55
59					0.59
77	26.98	35.15	22.86		0.60
92	26.65	35.15	22.96		0.65
106	26.42	35.15	23.04		0.70
119	25.54	35.02	23.21		0.87
138	22.60	34.87	23.97		0.91
161	16.42	34.67	25.42		1.41
183	13.40	34.62	26.04		1.99
229	11.02	34.71	26.57		2.73
275	09.82	34.71	26.77		2.67
321	09.28	34.67	26.83		2.63
368	08.96	34.64	26.86		2.68
368					2.60

STATION 8

M/V Hugh M. Smith: Cruise 16, 5°06'N, 149°51'W., July 30, 1952.
Messenger time: 0511 GCT. Weather: 02, cloud coverage 5.
Wind: 120°, 18 kt. Sea: 5-8 ft. Wire angle: 06°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
05	27.53	34.87	22.47		0.55
58	27.46	34.88	22.50		0.55
97	27.10	35.05	22.74		0.54
116	27.08	35.03	22.74		0.62
135	25.76	34.95	23.09		0.81
154	20.44	34.83	24.53		1.25
173	15.13	34.68	25.72		1.64
173					1.59
196	12.30	34.60	26.24		2.09
221	10.59	34.64	26.59		2.28
246	09.89	34.66	26.72		2.42
246					2.49
293	09.28	34.66	26.83		2.47
343	09.00	34.69	26.90		2.47
392	08.78	34.66	26.91		2.46

STATION 9

M/V Hugh M. Smith: Cruise 16, 4°34'N, 149°51'W., July 30, 1952. Messenger time: 1104 GCT. Weather: 02, cloud coverage not recorded. Wind: 110°, 16 kt. Sea: 5-8 ft. Wire angle: 12°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
05	27.60	34.82	22.41		0.57
60	27.59	34.81	22.41		0.57
97	27.21	34.88	22.58		0.61
116	26.80	34.90	22.73		0.79
135	24.88	34.92	23.34		0.97
153	18.42	34.76	25.00		1.34
173	14.54	34.64	25.81		1.78
192	12.90	34.61	26.15		2.05
192					1.99
215	10.96	34.62	26.51		2.17
239	09.97	34.68	26.73		2.36
287	09.39	34.70	26.84		2.48
335	09.27	34.69	26.85		2.52
385	08.88	34.69	26.92		2.59

STATION 10

M/V Hugh M. Smith: Cruise 16, 4°02'N, 149°52'W., July 30, 1952. Messenger time: 1658 GCT. Weather: 02, cloud coverage 1. Wind: 120°, 17 kt. Sea: 5-8 ft. Wire angle: 28°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	27.60	34.80	22.40		0.51
52	27.61	34.80	22.39		0.54
52					0.50
86	27.38	34.84	22.50		0.53
102	26.70	34.85	22.72		0.73
119	25.68	34.88	23.06		0.81
135	22.62	34.88	23.97		1.11
152	15.26	34.67	25.68		1.56
169	14.48	34.65	25.83		1.70
189	12.20	34.60	26.26		1.87
210	10.96	34.65	26.53		2.01
251	10.04	34.70	26.73		2.27
294	09.76	34.71	26.78		2.37
336	09.50	34.69	26.81		2.40

STATION 11

M/V Hugh M. Smith: Cruise 16, 3°32'N, 149°53'W., July 30, 1952.
Messenger time: 2240 GCT. Weather: 02, cloud coverage 2.
Wind: 100°, 19 kt. Sea: 5-8 ft. Wire angle: 40°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	27.67	34.81	22.38		0.57
46	27.60	34.80	22.40		0.57
76	27.45	34.81	22.45		0.59
90	26.84	34.90	22.72		0.74
105	26.86	34.99	22.78		0.70
118	25.82	34.94	23.06		0.93
130	23.08	34.92	23.87		1.14
130					1.09
144	20.65	34.87	24.51		1.41
144					1.33
160	16.60	34.76	25.44		1.57
175	12.44	34.64	26.24		1.96
175					2.04
208	10.86	34.70	26.59		2.11
242	10.45	34.71	26.67		2.19
282	10.41	34.76	26.71		2.33
282					2.28

STATION 12

M/V Hugh M. Smith: Cruise 16, 3°02'N, 149°59'W., July 31, 1952.
Messenger time: 0427 GCT. Weather: 02, cloud coverage 1.
Wind: 120°, 19 kt. Sea: 5-8 ft. Wire angle: 43°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	27.47	34.84	22.47		0.54
45	27.43	34.85	22.49		0.57
45					0.53
72	27.31	34.86	22.54		0.56
97	26.72	35.05	22.87		0.69
110	26.72	35.06	22.87		0.83
121	26.52	35.08	22.95		0.76
133	23.03	34.87	23.85		1.08
146	17.78	34.79	25.18		1.48
158	13.98	34.64	25.93		1.71
171	13.10	34.61	26.09		1.78
197	11.46	34.77	26.53		2.03
234	11.18	34.80	26.60		1/
2/					

1/ No sample.

2/ Bottle pretripped.

STATION 13

M/V Hugh M. Smith: Cruise 16, 2°30'N, 150°02'W., July 31, 1952. Messenger time: 1015 GCT. Weather: 02, cloud coverage not recorded. Wind: 100°, 18 kt. Sea: 3-5 ft. Wire angle: 43°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	27.40	34.89	22.53		0.58
43	27.40	34.93	22.56		0.57
71	26.86	35.01	22.79		0.66
71					0.62
96	26.52	35.13	22.99		0.70
108	26.25	35.01	22.98		0.74
121	24.40	34.85	23.43		0.98
133	21.02	34.86	24.40		1.26
133					1.21
147	17.08	34.74	25.31		1.47
160	16.09	34.74	25.55		1.54
174	12.06	1/			1/
203	11.57	34.86	26.58		2.31
203					2.40
238	11.14	34.81	26.62		2.10
277	11.04	34.80	26.63		2.30

1/ No samples.

STATION 14

M/V Hugh M. Smith: Cruise 16, 1°57'N, 150°07'W., July 31, 1952. Messenger time: 1602 GCT. Weather: 80, cloud coverage 9. Wind: 110°, 17 kt. Sea: 3-5 ft. Wire angle: 45°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	27.26	34.93	22.60		0.51
41	27.26	34.92	22.60		0.51
66	26.84	35.01	22.80		0.57
89	26.42	35.03	22.94		0.68
99	25.42	34.94	23.19		0.82
110	24.66	34.99	23.46		0.84
122	22.54	34.90	24.01		0.93
135	17.70	34.73	25.16		1.30
147	15.72	34.68	25.58		1.43
160	13.76	34.63	25.97		1.59
160					1.65
188	11.87	34.83	26.50		2.28
226	11.28	34.77	26.56		2.09
266	11.08	34.77	26.60		2.14

STATION 15

M/V Hugh M. Smith: Cruise 16, 1°24'N, 149°57'W., July 31, 1952.
Messenger time: 2203 GCT. Weather: 03, cloud coverage 3.
Wind: 130°, 21 kt. Sea: 3-5 ft. Wire angle: 52°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (μg at/l)
04	27.29	34.94	22.60		0.57
30	27.14	34.94	22.65		0.59
43	26.68	35.06	22.88		0.59
55	26.59	35.04	22.90		0.65
65	26.50	35.05	22.94		0.68
75	26.06	35.06	23.08		0.78
87	25.88	35.05	23.13		0.71
97	24.68	35.07	23.51		0.85
109	23.30	35.00	23.87		0.87
121	21.32	34.90	24.35		1.03
147	14.92	34.69	25.77		1.47
177	11.96	34.69	26.38		1.81
211	11.52	34.80	26.54		2.19
211	11.46	34.80	26.55		

STATION 16

M/V Hugh M. Smith: Cruise 16, 0°57'N, 150°01'W., August 1, 1952.
Messenger time: 0317 GCT. Weather: 02, cloud coverage 1.
Wind: 100°, 16 kt. Sea: 3-5 ft. Wire angle: 58°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (μg at/l)
03	27.03	35.03	22.75		0.59
27	26.91	35.02	22.78		0.63
51	26.50	35.05	22.94		0.82
71	26.08	35.12	23.12		0.78
82	25.76	35.12	23.22		0.75
90	25.32	35.14	23.37		0.80
100	23.94	35.08	23.74		0.83
110	20.46	34.91	24.59		1.10
110					1.05
120	18.94	34.88	24.96		1.13
132	17.80	34.87	25.24		1.16
132					1.25
157	14.22	34.72	25.94		1.52
184	12.20	34.71	26.34		1.80
248	11.32	34.80	26.58		2.12

STATION 17

M/V Hugh M. Smith: Cruise 16, 0°28'N, 150°01'W., August 1, 1952. Messenger time: 0857 GCT. Weather: 02, cloud coverage 2. Wind: 090°, 18 kt. Sea: 3-5 ft. Wire angle: 57°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	26.48	35.08	22.96		0.70
04					0.64
28	26.43	35.08	22.98		0.67
52	26.03	35.14	23.15		0.67
73	25.38	35.21	23.40		0.76
82	24.97	35.20	23.52		0.78
89	24.24	35.19	23.73		0.86
99	22.41	35.10	24.20		0.94
108	20.94	35.12	24.62		1.03
121	17.34	35.03	25.47		1.26
134	17.24	35.14	25.58		1.32
162	14.38	34.91	26.05		1.55
195	12.77	34.90	26.38		1.74
271	11.64	34.82	26.53		1.99

STATION 18

M/V Hugh M. Smith: Cruise 16, 0°06'S, 149°55'W., August 1, 1952. Messenger time: 1432 GCT. Weather: 02, cloud coverage not recorded. Wind: 080°, 16 kt. Sea: 3-5 ft. Wire angle: 58°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	26.22	35.16	23.11		0.66
28	26.18	35.16	23.12		0.66
51	25.94	35.22	23.24		0.67
71	25.48	35.31	23.45		0.76
79	24.96	35.30	23.60		0.80
89	24.56	35.41	23.80		0.88
96	24.58	35.53	23.89		0.90
106	23.32	35.51	24.25		1.04
119	22.18	35.61	24.65		1.07
130	19.60	35.19	25.03		1.15
158	16.52	35.12	25.74		1.39
192	13.44	34.89	26.24		1.65
276	11.66	34.85	26.55		2.11

STATION 19

M/V Hugh M. Smith: Cruise 16, 0°39'S, 149°49'W., August 1, 1952.
Messenger time: 2012 GCT. Weather: 02, cloud coverage 5.
Wind: 130°, 21 kt. Sea: 8-12 ft. Wire angle: 55°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
					1/
03	26.22	35.22	23.15		0.53
30	26.20	35.22	23.16		0.56
58	26.10	35.28	23.24		0.55
83	25.96	35.44	23.40		0.60
108	24.60	35.96	24.21		0.78
108					0.84
120	22.37	35.79	24.73		0.93
131	18.88	35.38	25.36		1.02
145	17.48	35.35	25.68		1.21
161	15.70	35.18	25.97		1.26
178	14.24	34.97	26.13		1.35
2/					
234	12.10	34.88	26.50		1.80
320	11.08	34.83	26.65		2.11

1/ The phosphate analysis on this station appears to have been faulty; all values are somewhat low.

2/ Bottle pretripped.

STATION 20

M/V Hugh M. Smith: Cruise 16, 0°59'S, 149°50'W., August 2, 1952.
Messenger time: 0033 GCT. Weather: 02, cloud coverage 1.
Wind: 090°, 17 kt. Sea: 5-8 ft. Wire angle: 52°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	26.44	35.28	23.13		0.72
32	26.32	35.27	23.16		0.73
61	26.28	35.14	23.07		0.70
90	26.25	35.45	23.31		0.80
103	26.28	35.55	23.38		0.83
116	23.36	35.87	24.51		1.09
127	21.04	35.83	25.13		1.14
140	19.07	35.61	25.49		1.33
156	15.92	35.33	26.04		1.58
169	14.30	35.06	26.19		1.56
203	13.78	35.07	26.30		1.69
239	11.82	34.90	26.56		2.22
321	11.31	34.86	26.63		2.26

STATION 21

M/V Hugh M. Smith: Cruise 16, 1°28'S, 149°45'W., August 2, 1952. Messenger time: 0527 GCT. Weather: 02, cloud coverage not recorded. Wind: 090°, 18 kt. Sea: 5-8 ft. Wire angle: 29°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	26.52	35.35	23.16		0.69
44	26.49	35.38	23.19		0.70
87	26.57	35.50	23.25		0.68
131	21.04	35.75	25.07		1.15
152	16.14	35.35	26.00		1.58
175	14.72	35.17	26.18		1.72
197	12.88	34.98	26.42		2.18
220	12.35	34.92	26.48		2.32
242	12.16	34.89	26.49		2.38
264	11.96	34.90	26.54		2.47
264					2.38
310	11.46	34.84	26.58		2.60
355	10.78	34.85	26.72		2.68
448	08.28	34.72	27.03		2.77
448					2.73

STATION 22

M/V Hugh M. Smith: Cruise 16, 1°58'S, 149°48'W., August 2, 1952. Messenger time: 1058 GCT. Weather: 02, cloud coverage 1. Wind: 090°, 16 kt. Sea: 5-8 ft. Wire angle: 05°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
05	26.90	35.63	23.25		0.73
49	26.91	35.64	23.25		0.72
97	26.88	35.61	23.24		0.70
122	23.32	35.68	24.38		1.10
146	17.14	35.37	25.78		1.56
170	14.77	35.15	26.16		1.93
195	12.76	34.95	26.42		2.31
219	12.40	34.94	26.48		2.27
244	12.14	34.91	26.51		2.25
268	11.83	34.94	26.59		2.24
293	11.66	34.87	26.57		2.35
343	10.68	34.80	26.70		2.69
394	09.60	34.71	26.81		2.86

STATION 23

M/V Hugh M. Smith: Cruise 16, 2°29'S, 149°53'W., August 2, 1952.
Messenger time: 1633 GCT. Weather: 03, cloud coverage 5.
Wind: 090°, 18 kt. Sea: 3-5 ft. Wire angle: 10°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
05	27.10	35.56	23.13		0.55 [1/]
49	27.10	35.58	23.15		0.55
77	27.00	35.59	23.18		0.53
97	26.67	35.60	23.30		0.62
117	23.44	35.70	24.36		0.92
135	19.92	35.61	25.27		1.12
155	14.36	35.12	26.22		1.88
172	12.72	34.94	26.42		2.24
192	12.56	34.95	26.46		2.18
216	12.28	34.93	26.50		2.08
264	11.75	34.88	26.56		2.27
312	11.42	34.86	26.61		2.14
386	10.36	34.80	26.75		2.48

1/ The phosphate analysis on this station appears to have been faulty; all values are somewhat low.

STATION 24

M/V Hugh M. Smith: Cruise 16, 2°59'S, 149°59'W., August 2, 1952.
Messenger time: 2203 GCT. Weather: 02, cloud coverage 2.
Wind: 120°, 15 kt. Sea: 3-5 ft. Wire angle: 20°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
05	27.37	35.52	23.01		0.74
05					0.69
45	27.24	35.54	23.07		0.73
72	27.22	35.53	23.07		0.66
72					0.75
89	27.12	35.52	23.09		0.73
103	25.76	35.66	23.62		0.93
116	22.10	35.61	24.67		1.20
116					1.13
129	20.82	35.61	25.02		1.29
143	17.82	35.44	25.67		1.54
161	14.18	35.09	26.23		2.15
161					2.01
179	12.86	34.96	26.41		2.37
225	11.93	34.88	26.53		2.35
271	11.52	34.86	26.59		2.19
364	10.32	34.78	26.74		2.33

STATION 25

M/V Hugh M. Smith: Cruise 16, 3°29'S, 149°57'W., August 3, 1952.
Messenger time: 0319 GCT. Weather: 02, cloud coverage 4.
Wind: 120°, 20 kt. Sea: 3-5 ft. Wire angle: 28°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	27.41	35.40	22.91		0.67
44	27.28	35.43	22.97		0.66
68	27.26	35.44	22.99		0.62
84	27.26	35.43	22.98		0.65
96	27.28	35.41	22.96		0.65
108	26.42	35.68	23.43		0.80
120	23.65	35.82	24.38		0.95
131	19.59	35.52	25.28		1.34
143	15.62	35.21	26.01		1.76
161	13.15	34.99	26.37		2.27
199	12.32	34.92	26.48		2.34
238	11.72	34.87	26.56		2.31
325	10.61	34.81	26.71		2.28

STATION 26

M/V Hugh M. Smith: Cruise 16, 3°59'S, 150°05'W., August 3, 1952.
Messenger time: 0835 GCT. Weather: 02, cloud coverage 9.
Wind: 110°, 15 kt. Sea: 3-5 ft. Wire angle: 30°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
05	27.24	35.47	23.02		0.67
43	27.24	35.45	23.00		0.65
67	27.18	35.48	23.04		0.61
83	27.20	35.45	23.01		0.64
95	27.21	35.45	23.01		0.63
106	27.18	35.46	23.03		0.65
117	26.59	35.64	23.35		0.78
129	24.09	35.85	24.28		0.93
140	19.52	35.56	25.33		1.29
157	16.32	35.26	25.89		1.72
192	12.56	34.91	26.43		2.26
231	11.77	34.87	26.55		2.21
311	10.43	34.78	26.72		2.14

STATION 27

M/V Hugh M. Smith: Cruise 16, 4°29'S, 150°12'W., August 3, 1952. Messenger time: 1357 GCT. Weather: 02, cloud coverage not recorded. Wind: 120°, 16 kt. Sea: 3-5 ft. Wire angle: 29°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
05	27.21	35.29	22.89		0.66
63	27.19	35.41	22.99		0.65
82	27.15	35.43	23.01		0.64
94	27.14	35.46	23.04		0.65
105	27.16	35.47	23.04		0.66
117	26.94	35.53	23.16		0.70
128	25.36	35.73	23.80		0.81
128					0.86
139	20.48	35.68	25.17		1.12
150	17.63	35.35	25.65		1.48
164	15.50	35.22	26.05		1.71
193	13.54	35.05	26.34		1.89
231	12.32	34.94	26.50		1.91
312	10.50	34.79	26.72		2.19

STATION 28

M/V Hugh M. Smith: Cruise 16, 5°02'S, 150°12'W., August 3, 1952. Messenger time: 1920 GCT. Weather: 25, cloud coverage 3. Wind: 120°, 17 kt. Sea: 3-5 ft. Wire angle: 28°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	27.29	35.43	22.97		0.58
04					0.74
63	27.28	35.41	22.96		0.58
83	27.27	35.43	22.97		0.52
83					0.47
96	27.26	35.46	23.00		0.60
108	27.26	35.49	23.03		0.56
120	27.18	35.44	23.01		0.63
132	25.96	35.62	23.53		0.73
144	23.40	35.73	24.39		0.96
156	19.94	35.58	25.24		1.13
173	16.62	35.37	25.91		1.52
206	12.84	34.98	26.43		1.92
249	11.36	34.86	26.62		2.05
335	10.09	34.78	26.79		2.24

STATION 29

M/V Hugh M. Smith: Cruise 16, 6°00'S, 150°10'W., August 4, 1952. Messenger time: 0326 GCT. Weather: 01, cloud coverage 1. Wind: 120°, 18 kt. Sea: 3-5 ft. Wire angle: 22°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
04	27.41	35.51	22.99		0.66
55	27.30	35.51	23.03		0.65
92	27.28	35.53	23.05		0.61
128	27.10	35.60	23.16		0.70
146	23.67	35.81	24.37		0.99
164	21.36	35.81	25.03		1.02
182	18.26	35.48	25.59		1.23
200	15.78	35.19	25.96		1.48
218	13.26	34.97	26.33		1.94
236	12.22	34.90	26.49		2.06
272	11.19	34.87	26.66		2.14
308	09.83	34.76	26.81		2.25
364	09.22	34.72	26.88		2.24

STATION 30

M/V Hugh M. Smith: Cruise 16, 6°58'S, 150°05'W., August 4, 1952. Messenger time: 1133 GCT. Weather: 02, clear. Wind: 100°, 17 kt. Sea: 3-5 ft. Wire angle: 32°

OBSERVED

DEPTH (m)	T (°C)	S (°/oo)	σ_t (g/l)	O_2 (ml/l)	PO_4-P (µg at/l)
05	27.67	35.31	22.75		0.60
63	27.50	35.44	22.91		0.60
94	27.39	35.51	23.00		0.58
115	27.31	35.51	23.03		0.64
128	27.19	35.61	23.14		0.66
141	26.68	35.92	23.53		0.79
153	25.08	36.05	24.13		0.86
153					0.96
171	21.88	35.89	24.94		0.98
192	18.52	35.51	25.55		1.15
214	15.10	35.13	26.07		1.54
258	12.20	34.85	26.45		2.07
303	10.49	34.76	26.70		2.23
350	09.32	34.69	26.84		2.28